

AD-A218 123



DTIC  
ELECTE  
FEB 20 1990  
S D  
Co



**DISTRIBUTION STATEMENT A**  
Approved for public release  
Distribution Unlimited

DEPARTMENT OF THE AIR FORCE  
AIR UNIVERSITY  
**AIR FORCE INSTITUTE OF TECHNOLOGY**

Wright-Patterson Air Force Base, Ohio

90 02 20 001

2

AFIT/GIR/LSY/89D-7

DTIC  
ELECTE  
FEB 20 1990  
S D D

THE EFFECT OF MANAGEMENT INFORMATION  
SYSTEMS ON SUPERVISORS WITHIN A  
MILITARY ENVIRONMENT

THESIS

John L. O'Brien  
Captain USAF

AFIT/GIR/LSY/89D-7

Approved for public release; distribution unlimited

The contents of the document are technically accurate, and no sensitive items, detrimental ideas, or deleterious information is contained therein. Furthermore, the views expressed in the document are those of the author and do not necessarily reflect the views of the School of Systems and Logistics, the Air University, the United States Air Force, or the Department of Defense.



Accession For	
NTIS CRA&I	<input checked="" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
By	
Distribution /	
Availability Codes	
Dist	A and/or Special
A-1	

AFIT/GIR/LSY/89D-7

THE EFFECT OF MANAGEMENT INFORMATION SYSTEMS  
ON SUPERVISORS WITHIN A MILITARY ENVIRONMENT

THESIS

Presented to the Faculty of the School of  
Systems and Logistics

of the Air Force Institute of Technology

Air University

In Partial Fulfillment of the

Requirements for the Degree of

Master of Science in Information Resource Management

John L. O'Brien, B.A., M.P.A.  
Captain, USAF

December 1989

Approved for public release; distribution unlimited

## Preface

The writing of a thesis is not something one does solo. I am deeply indebted to three individuals for allowing me to use their organizations on Wright-Patterson AFB as a 'living laboratory.' Mr. James Dawson of the 2750 Civil Engineering Squadron, Mrs Judith Cummins of the 2750 Air Base Wing, and Ms. Patty Moore from Air Force Logistics Command Material Management all gave generously of their time and resources. A debt of gratitude is also owed the individual participants of each organization who answered questions of yet another AFIT student. Without them, my research would never have happened.

I also want to thank a good friend and comrade, Norman Watson, for all his assistance throughout AFIT.

A special thanks must be reserved for my thesis advisor, program director, teacher, and friend, Lt Col D. J. McBride. During the last eighteen months, she taught me more than information resource management. Through her quiet example, she taught me the meaning of the word 'master.' The single memory I will carry with me long after I leave AFIT is her look that simply and directly meant... 'John, I know you can do better.'

Finally, I thank the individuals who will always hold the most precious place in my heart, my wife Kathleen and daughters Erin and Eileen. They sacrificed so much for my education; I will not let them down.

## Table of Contents

	Page
Preface .....	ii
List of Tables .....	x
Abstract .....	xiv
I. Introduction .....	1
General Issue .....	1
Background .....	2
MIS Research and Organizations ..	2
PMIS .....	5
Trends .....	6
Summary .....	7
Problem Statement .....	8
Research Objectives .....	8
Research Questions .....	8
Question # 1 .....	8
Question # 2 .....	8
Definitions .....	9
Management Information System ...	9
Military Organization .....	9
Organizational Structure .....	9
Vertical Complexity .....	9
Span of Control .....	9
Centralization/Decentralization .	9
Importance of the Research .....	10
Scope and Limitations .....	12
Summary .....	14
II. Literature Review .....	15
Overview of Presentation of Literature .....	15
Technology and Organizational Structure .....	16
Introduction .....	16
Joan Woodward .....	17
The Aston Studies .....	19
Related Research .....	19
Charles Perrow .....	20
James Thompson .....	22
The Systems Approach .....	23

II. Literature Review (Cont) .....	Page
MIS and Organization Structure .....	25
Introduction .....	25
Centralization .....	26
Decentralization .....	30
No Impact/Moderating Influences .	33
Span of Control/ Vertical Complexity .....	37
Ideas for the Future .....	42
III. Methodology .....	45
Introduction .....	45
The Clowes Study .....	45
The Reif Study .....	46
The Blau <u>et al.</u> Study .....	48
The Bjorn-Anderson <u>et al.</u> Study .	50
MIS Impact on Military Organizations .	53
Conclusion .....	58
IV. Analysis of Findings .....	59
Introduction .....	59
MIS Background Information .....	59
Work Information System (WIMS) ..	60
Base Headquarters Automated Network (BHAN) .....	61
Material Management Office Information System (MMOIS) .....	62
Responses to Common Questions .....	63
Background Information on Participants .....	63
Please describe your access to the MIS? For example, is it very restrictive or unlimited? How often do you use the MIS? .....	64
What sort of things do you use the MIS for? .....	67

IV. Analysis of Findings (Cont) ..... Page

Do you feel you have the knowledge of how the MIS operates which allows you to accomplish your job? ..... 68

Have you been a user of other similar, computerized management information systems? If so, was it in this organization? If so, then compared to the best such other system, how would you rate this system? ..... 70

How would you finish the following statements: ..... 72

Do you receive regular routine outputs from the MIS, as required by your job? If so, how often? Would it be possible to get copies of these? ..... 74

Do you voluntarily request and receive any optional, ad hoc, reports or special features of the MIS for your job? If so, how often? Would it be possible to get copies of these? ..... 75

Conclusions to Common Questions ..... 77

Response to Research Questions ..... 80

The term span of control means the number of subordinates who report directly to any one supervisor. In those organizational units to which the MIS has been applied, has the average supervisory span of control changed in any way? Please identify the affected units and tell me if the average span of control has increased, decreased, or remained unchanged ..... 80



IV. Analysis of Findings (Cont) ..... Page

If there was a change, how much  
of the change do you attribute  
to the implementation of the MIS? 81

Have you perceived any changes  
in your span of control since  
the implementation of the MIS?  
By this I mean has the number of  
people who report directly to  
you increased, decreased, or  
remained unchanged? ..... 82

Summary ..... 83

Have you perceived any changes  
in your span of control since  
the implementation of the MIS?  
By this I mean has the number of  
people who report directly to  
you increased, decreased, or  
remained unchanged? ..... 85

If there was a change, how much  
of the change do you attribute  
to the implementation of the MIS? 86

Summary ..... 86

The term vertical complexity means  
the number of hierarchical levels  
between a supervisor and other  
members of his/her organizational  
hierarchy. In those organizational  
units to which the MIS has been  
applied, has the vertical complex-  
ity changed in any way? Please  
identify the affected units and  
tell me if the vertical complexity  
has increased, decreased, or  
remained unchanged ..... 88

If there was a change, how much  
of the change do you attribute  
to the implementation of the MIS? 89

IV. Analysis of Findings (Cont) ..... Page

Have you perceived any changes in the vertical complexity of your organization since the implementation of the MIS? By this I mean are there more levels between you and lower levels? ..... 90

Summary ..... 91

Have you perceived any changes in the vertical complexity of your organization since the implementation of the MIS? By this I mean are there more levels between you and lower levels? ..... 92

If there was a change, how much of the change do you attribute to the implementation of the MIS? 93

Have any new departments or sections been created as a result of the MIS? Have any old departments or sections been eliminated as a result of the MIS? What changes in the locations of specific functions have been made as a result of the MIS? For example, has there been any shifting around of activities or people? ..... 95

Conclusions to Research Questions .... 97

Individual Questions ..... 99

V. Conclusions and Recommendations ..... 100

Introduction ..... 100

Conclusions (Research Question # One). 100

Conclusions (Research Question # Two). 102

Recommendations for Future Research .. 103

Summary ..... 104

Appendix A:	Interview Guide.....	Page 105
Appendix B:	MIS Implementation Interview Guide -- Systems Managers.....	106
Appendix C:	MIS Implementation Interview Guide -- Top-Level Management....	109
Appendix D:	MIS Implementation Interview Guide -- Mid-Level/First Line Supervisors.....	117
Appendix E:	Responses to Individual Questions	126
	Responses to Individual Questions - (Top Level Management) .....	126
	I would like to determine your knowledge of the MIS's effect on your subordinates. Please tell me which subordinates use the MIS and how they use it to accomplish their job? .....	126
	In the organizational units in which the MIS has been applied, have the number of personnel changed as a consequence? .....	126
	Responses to Individual Questions - (Mid Level Management/First Line Supervisors .....	128
	Have you perceived any overall changes in the following departmental/interdepartmental aspects of manager- subordinate relationship since implementation of the MIS? How much of the change do you attribute to the MIS? .....	128
	Summary .....	138

Appendix E: Responses to Individual Questions Cont)	Page
Have you perceived any influence by the implementation of the MIS on your contact or consultations with your supervisor? Have you perceived any influence by the implementation of the MIS on your contact or consultations with your subordinates?	140
Have you perceived any overall changes in the degree of discretion you practice in your organization, regarding influence on specific tasks? How much of the change do you attribute to the MIS?	141
Summary	150
Conclusions to Individual Questions	151
Appendix F: Sample WIMS Menu: Base Civil Engineer	153
Appendix G: Sample WIMS Regular Report: Emergency Job Orders	154
Appendix H: Sample BHAN Roster: Chemical Equipment Inventory	155
Appendix I: Sample MMOIS Report: Template	156
Bibliography	157
Vita	168

# List of Tables

Table	Page
1. Woodward's Technology Framework and Organization Structure/Excerpts.....	18
2. Perrow's Relationship Between Department Technology and Organization Structure....	21
3. Thompson's Technology and Interdependence Framework.....	22
4. Whisler's Effect of EDP on Average Span of Control as Determined from Three Different Sources of Information.....	41
5. Whisler's Changes in the Number of Organizational Levels in EDP-Affected Areas, reported by Department and Company.....	41
6. Robey's Model for Managing Information Systems Impacts.....	43
7. Blau's Measures of Association Between Dimensions of Structure and Indices of Technology .....	50
8. Number and Level of Participants .....	63
9. Average Length of Time on Job in Years - (Number of Civilians/Military) .....	64
10. Average Length of Time in Organization in Years - (Number of Civilians/Military)...	64
11. Access to the MIS .....	65
12. Average Number of Interactions Per Workday.	65
13. Use of the MIS .....	66
14. Functional Usage for the MIS .....	67
15. Level of Knowledge .....	69
16. Use of Similar MIS (TLM) .....	70
17. Use of Similar MIS (MLM/FLS) .....	70
18. Ratings of Similar MIS (TLM) Per Organization .....	71

	page
19. Ratings of Similar MIS (MLM/FLS) Per Organization .....	71
20. Usefulness Rating (TLM) Per Organization .	72
21. Usefulness Rating (MLM/FLS) Per Organization .....	72
22. Time-Saving Rating (TLM) Per Organization .	73
23. Time-Saving Rating (MLM/FLS) Per Organization .....	73
24. Receipt of Regular Reports .....	74
25. Receipt of Ad Hoc Reports .....	76
26. Change in Average Span of Control (TLM) .	81
27. Ratings of MIS Impact (TLM) Span of Control - By Organization .....	81
28. Change in Personal Span of Control (TLM) .	83
29. Change in Personal Span of Control (MLM/FLS) .....	85
30. Ratings of MIS Impact (MLM/FLS) Span of Control - By Organization .....	86
31. Change in Average Vertical Complexity (TLM) .	88
32. Ratings of MIS Impact (TLM) Vertical Complexity - By Organization .....	89
33. Change in Personal Vertical Complexity (TLM)	90
34. Change in Personal Vertical Complexity (MLM/FLS) .....	92
35. Ratings of MIS Impact (MLM/FLS) Vertical Complexity - By Organization .....	93
36. Change in Organization Structure (TLM) ..	95
37. Change in Organization Structure (MLM/FLS) .	95
38. Differences Between Organizations .....	98
39. Changes at the Clerical Level .....	126

	page
40. Changes at the First Line Supervisor Level.	127
41. Changes at the Middle/Top Management Level.	127
42. Subordinates Requesting Authorization From You - By Organization .....	129
43. Subordinates Requesting Action From You - By Organization .....	130
44. Your Receiving Reports on Operations - By Organization .....	131
45. Your Giving Information to Subordinates - By Organization .....	132
46. Your Requesting Something From Subordinates - By Organization .....	133
47. Your Requesting Authorization From Colleagues/Superiors - By Organization ..	134
48. Your Requesting Superiors or Colleagues for Action - By Organization .....	135
49. Your Receiving Reports on Operations - By Organization .....	136
50. Your Giving Information to Superiors or Colleagues - By Organization .....	137
51. Superiors and Colleagues Requesting Something From You - By Organization ....	138
52. Summary of Means .....	139
53. Perceived Changes in Contact With Supervisors .....	140
54. Perceived Changes in Contact With Subordinates .....	141
55. Degree to Which You Determine How a Task is Carried Out - By Organization .....	142
56. Degree to Which You Determine When a Task is Carried Out - By Organization .....	143
57. Degree to Which You Determine Whether a Task Has Been Carried Out - By Organization .....	144

58. Degree to Which Orders and Advice Are Received From Supervisors - By Organization .....	page 145
59. Degree to Which Requests and Demands Are Received From Subordinates - By Organization .....	146
60. Degree to Which You are Controlled in Handling Tasks - By Organization .....	147
61. Degree to Which You Are Dependent on the Work of Others - By Organization .....	148
62. Degree to Which There are Rules, Procedures, and Methods Which are to be Followed .....	149
63. Changes in Task Discretion .....	150



Abstract

Studies on the effect of management information systems (MIS) on organizational structure have been disparate. Research has documented changing spans of supervisory control and modifications to the number of levels of hierarchy in public and private sector organizations. Unfortunately, existing MIS research does not often apply to public sector/military MIS. This thesis examined military organizations and studied user perceptions regarding the relationship between MIS implementation and organizational structure changes.

Organizational structure changes will be determined by focusing on two specific characteristics: supervisory span of control and vertical complexity. Perceived changes to these characteristics (increases/decreases) were measured from two levels: top level management and mid level/first line supervisors.

The study found that, for the specific research population, a perceived change in span of control did not occur following MIS implementation. There is some evidence of both increases and decreases to span of control but the data is not strong enough to suggest any direct causal relationship.

The study also found that, for the specific research population, little perceived changes in the vertical complexity of the organizational hierarchy occurred following implementation of MIS. What changes did occur were basically decreases, but the data is not strong enough to suggest any direct causal relationship.

Within a military environment, MIS appear to have little formal effect on span of control or vertical complexity. However, MIS do appear to have stronger informal effect. Military managers found an increased tendency to overlook formal reporting relationships and formal chain of command. MIS provided more opportunities for informal communication with subordinates, regardless of whom they worked for or what department they worked in.

# THE EFFECT OF MANAGEMENT INFORMATION SYSTEMS ON SUPERVISORS WITHIN A MILITARY ENVIRONMENT

## I. Introduction

### General Issue

Studies on the effect of management information systems (MIS) on organizational structure have been disparate. Some research has documented significant differences in structure following MIS implementation; for example, there is evidence of both centralization and decentralization, changing spans of supervisory control, and overall modifications to the number of levels of structural hierarchy in public and private sector organizations. To illustrate the diversity of the research, one author felt that MIS "...do not cause structural changes in organizations" (93:686), while another concluded the opposite: MIS lead to situations in which "...both the number of management levels and the number of managers can be sharply cut" (36:46). Current research is lacking, however, on the effect of MIS on military organizations. The effect of MIS may be altered by the military environment.

## Background

MIS Research and Organizations. "From its beginnings as a province of a few people in the accounting and billing operations," King and Kraemer write, "computing has evolved to the point that it is now an essential component in nearly all aspects of modern organizations" (65:5). Smeds, in an investigation of MIS and the development of organizational structure, noted:

Business organizations are today facing a period of rapid computerization of almost all functions. Moreover, the environment of organizations is changing because of the new strategic possibilities of information technology. (98:90)

The application of MIS as a support for managerial decision making has shown significant increases since the computer entered the business community over thirty years ago. (96:17)

One definition of MIS research effort is the "systematic investigation of the development, operation, use, and/or impact of an information (sub)system in an organizational environment" (59:910). This focus of MIS research has become particularly significant since major technological advances in MIS are reported as causing substantial changes in organizational form and function in the past half decade (46:229). Markus and Robey note:

The relationship between information technology and organizational change is a central concern in the field of Information Systems (IS)....Few researchers question the importance of the issue. (78:583)

Zmud and Cox add:

The implementation of many MIS's radically alters the duties and responsibilities of organizational members. The resulting impact affects both formal and informal relationships among personnel as well as their particular relationships with and attitudes toward the organization. (117:42)

MIS implementation has been shown to impact formal and informal organizational structure (96:22), affect organizational efficiency and productivity, as well as employee quality of work-life (73:220), and cause social and technical changes (14) (95). Kraut and others note:

The rapid spread of computer and telecommunications technologies throughout white-collar work has forced social scientists to consider the impact of these technologies on the people who use them directly and on the work force and economy as a whole. (73:220)

Kraemer and King feel the introduction of MIS technology into an organization has a substantial impact on that organization, the consequences of which must be anticipated in order to be dealt with effectively (69:32). In an examination of MIS research literature citation patterns, Culnan identified 'computer impacts' as a clear and consistent subfield of MIS research, describing it as 'research on the social and organizational impacts of computing' (25:162-163).

MIS technology affects organizational structure at multiple-levels (96:18) (98:90). Despite the coupling of MIS and organizations, Markus and Robey note the empirical research literature is not convincing enough at present to confirm consistent relationships between

information technology and organizational change

(78:583). In suggesting several reasons for this, they feel the literature...

- a) contains works by researchers from several academic disciplines and interdisciplinary specialties, including organizational theory, management science, sociology, and computer science, each with its own preferred concepts and theoretical and methodological bias...
- b) includes conflicting and unclear definitions and measures of information technology and organizational structure...
- c) mixes and crosses units and levels of analysis from the individual, the workgroup, the department, the organization, and society -- a practice which leads some observers to fear improperly specified models and ungeneralizable findings. (78:583-584)

Robey, in an earlier work, also commented:

Unfortunately, our knowledge of the area [the impact of MIS on organizational structure] is clouded by unsystematic research and by speculative armchair journalism...As a result, it is difficult to separate what we really know about the impact of computers in the workplace from popular fiction about organizations. (93:679)

Williams and Rowe note, "How technology affects an organisation is, therefore, far less important than how the organisation handles technology...." (114:3). In an analysis of office automation and organizational change, they feel it is important to "....focus on organisational factors and establish a company's make-up in order to understand how it is likely to respond to, and be changed by, the introduction of OA" (114:3). This viewpoint is summarized by Attewell and Rule who feel:

....evidence on these subjects [computers and organizations] is actually fragmentary and very mixed....Virtually none of the studies mounted so

far have been capable of yielding a persuasive and comprehensive view of computer-induced social change. (5:1184-1185)

All this dichotomy has led Kraemer and King to describe an atmosphere in which great speculation exists about the effect MIS will have on organizations but less research on the effects an MIS does have on organizations (70:488).

PMIS. The characteristics of MIS research can have particular application for the public sector (54, 77). However, Bozeman and Bretschneider (16) criticize much of the existing theoretical frameworks of MIS research for failing to accommodate public management information systems (PMIS). The Federal government has taken several significant steps to encourage computer applications among local governments (72:260). In spite of enormous interest,

....available knowledge of MIS is not of equal service to all managers. Managers working in the public sector must exercise particular caution as they seek to draw lessons from MIS literature. (16:475)

The majority of MIS research is based on data drawn from private sector contexts; therefore, conclusions must be cautiously applied to the public sector. Despite dramatic forecasts of revolutionary change in PMIS technology, research has failed to show evidence that such changes have improved public sector efficiency or effectiveness (64:25). Furthermore, while the overall volume of MIS research and theory has grown as the discipline grew, 'little research and virtually no theory has been published on public management information systems'

(16:475). This ignorance of PMIS problems becomes more significant since, as Boger and others note: 'The Federal information systems inventory is a collection of outdated hardware as well as software techniques and systems that were abandoned long ago in the private sector' (13:163).

The problem becomes compounded with the introduction of military administration as a sub-discipline of public administration. Some research has shown that military administrators lack identity with administrators in the 'traditional public sector' (60, 81, 100). Jefferies noted 'the two fields [public administration and military administration] are mutually relevant and important' yet there is 'a lack of interchange between them' (60:321-322).

Bozeman and Bretschneider argued that, of the empirical MIS research, little is applicable to the public sector (16). Jefferies added that, of that available to the public sector, little is applicable to the military (60). Miewald summed up the situation facing the military information resource manager by noting 'Despite the importance of the military today, more scholarly care seems to have been lavished on mosquito abatement districts' (79:1291).

Trends. Much of the research that does exist regarding MIS and organizational structure focuses on the issue of centralization vs. decentralization. Many early



researchers predicted centralization (1,2,20,34,35,40,41, 58,75,80,111,112,113) while others disagreed, favoring a decentralized trend (10,12,66,87,88,105,110,115). Finally, there were those who diplomatically recognized both results (4,9,21,29,30,31,33,48,57,62,63,67,68,70,71,74,89,91,92,93). Supervisory span of control (19,50,83,86,89,103,106,107) and the number of management levels in a hierarchy, often called 'vertical complexity' (27), were singularly examined, as well as examined in the context of other variables (10,11,12,52,55,87,90,111,113,115,116,118).

Summary. MIS have impacted organizations in a manner unimaginable a generation ago. However, empirical research into the effects of MIS implementation on organizational structure has been disparate and has focused primarily on the private sector. Little research has been done on MIS in public organizations, particularly in the military. The military environment may influence perceptions of change to structural characteristics. The effect of MIS on organizational structure within a military environment is a valid area of research.

### Problem Statement

What is the perceived impact of Management Information Systems on the structure of military organizations?

### Research Objectives

This study seeks to determine what, if any, user perceptions exist regarding the relationship between MIS implementation and organizational structure changes. 'Organizational structure changes' will be determined by changes in two organizational characteristics: supervisory span of control and vertical complexity.

### Research Questions

Question # 1. In measuring the effect of MIS on military organization structures, has there been a perceived increase or decrease in supervisory span of control, according to the perceptions of military or Department of Defense (DOD) civilian supervisors, following implementation? If so, by how many individuals?

Question # 2. In measuring the effect of MIS on military organization structures, has there been a perceived increase or decrease in vertical complexity within the military organization structure, according to the perceptions of military or Department of Defense (DOD) civilian supervisors, following implementation? If so, by how many levels?

## Definitions

Management Information System. 'An integrated, user-machine system for providing information to support operations, management, analysis, and decision-making functions in an organization. The system utilizes computer hardware and software, manual procedures, models for analysis, planning, control and decision making, and a database' (32:6).

Military Organization. Any department of Defense (DOD) agency that is staffed with military and/or civilian supervisors.

Organizational Structure. The explicit framework that 'describes the allocation of task responsibilities [and] designates formal organizations and reporting relationships, including lines of authority, decision responsibilities, number of levels in a hierarchy, and span of control of managers and supervisors' (27:361).

Vertical Complexity. 'The number of management levels in the hierarchy of authority' (27:219).

Span of Control. 'The number of subordinates who report directly to any one supervisor' (27:220).

Centralization/Decentralization. 'The distance between where a decision problem emerges and where in the organization hierarchy decisions about that problem are made' (70:488-489).

### Importance of the Research

In 1975, the United States Congress established the Commission on Federal Paperwork:

to study and investigate statutes, policies, rules, regulations, procedures, and practices of the Federal Government relating to gathering, processing, and disseminating information, and to managing and controlling information activities. (56:4).

The Commission's results led to the Paperwork Reduction Act of 1980 and the introduction of Information Resource Management (IRM), the underlying philosophy of which is to treat information as a valuable organizational resource to be acquired, maintained, and managed like any other basic resource (53:33). Vincent notes

The information needs of the Air Force have steadily increased with the demands of new complex technology, fewer resources, and the number and magnitude of decisions at senior levels. These demands have necessitated an improved method of keeping the decision makers informed. (109:22)

The Air Force Institute of Technology's IRM program is an attempt to put this philosophy into practice.

An area of concern for Air Force Information Resource Managers is the effect of MIS on organizations. It is important to have a general understanding of structural impacts since MIS permeate government and business organizations to a degree unheard of a generation ago. In addition,

As computer technology advances and costs decline, the MIS concept becomes even more viable and attractive in public service management....[However], the introduction of MIS into an organization represents a massive intervention into the internalized patterns

and expectations of organizational performance, that is, intervention into the organization's culture. (44:485-486)

An organization's success is based on its ability to manage data in order to process information that reduces uncertainty and clarifies ambiguity (26:5). Edelman notes that managing such organizational resources 'has become a task of literally overwhelming size and mind-boggling complexity' (39:17). Therefore, improvement the overall management of information is one of the most important challenges facing American business (39:17).

The value of a MIS can be measured quantitatively by such criteria as resources saved, but qualitative worth is more difficult to assess. Robey points out that

ever since the computer was first applied in business organizations....managers and management theorists have been intrigued by its potential effects on employment, job content, managerial work, and organization structure. (92:963)

Therefore, 'understanding the change of computing in organizations is important not only to help explain the present but it is essential for improving our ability to predict the future of information systems' (65:5). Do information systems developers focus only on output acceptance while ignoring other concerns? Do senior executives make demands on MIS that cannot be fulfilled while ignoring the capabilities the MIS can provide? Do first-line supervisors gnash their teeth at a system they didn't want and can't use?

If the undesirable consequence of a MIS is a bloated bureaucracy with increased hierarchical levels or wider spans of control, have we simply exchanged one set of problems for another? However, the problem need not be this 'worst-case' scenario. Any organizational impact caused by the MIS is significant since it may have an ultimate effect on the organization's return on capital investments.

#### Scope and Limitations

This research will concern itself with the impact of MIS implementation on organizational change, specifically examining individual supervisor's perceptions regarding changes to their span of control and their level of position within the organization hierarchy. The focus is on formal structure only; no attempt will be made to assess the impact of MIS on informal structures. This study will not attempt to measure changes to the quality of supervision as a result of systems implementation, nor will the issue of supervisory satisfaction be addressed. The study will, through a measurement instrument, identify the perceived effect computing has on military supervision.

Several limitations are inherent in this study. First, military organizations will have a limited corporate memory due to high turnover caused by frequent permanent changes of station. This could be a hindrance

to totally accurate comparisons of the organization before and after the implementation of the MIS. To compensate for this, the study will include both military and DOD civilian supervisors, in the hope that civilians will provide more continuity.

Another limitation is the inclusion of MIS that are primarily electronic data processing (EDP) systems, as specified by the organization selection criteria. Clark and Blazer noted in 1980 that the term MIS is inadequate to describe many of the information systems found in the defense system (22). As this thesis began, it was suspected that the situation hadn't changed, that the vast majority of United States Air Force MIS are EDP-based, transaction processing systems with little decision-making capabilities. This suspicion proved true for the organizations studied; the MIS were, conceivably, little more than office automation systems. A criticism could be made that this thesis shows no MIS effect on military supervision simply because no Air Force supervisor has access to a data-base oriented, decision-making MIS. Further research could expand the selection criteria to include both EDP systems for basic transaction processing and data/model based MIS. The information gathered will have value to the Information Management (IM) career field by showing how several types of MIS impact military organizations. This may affect future IRM program decisions.

## Summary

Chapter two, a review of literature related to organizational change, examines the effect of both general technology and information systems technology on organizational structure. Two key research studies germane to this thesis are examined in detail. The issue of public management information systems is also discussed.

The methodology used in this thesis is described in Chapter three. The case study method is used, consisting of a series of structured interviews with supervisors (both military and civilian) of all levels within a military organization. Chapter four will analyze the findings of these interviews and chapter five will present the conclusions and recommendations.



## II. Literature Review

### Overview of Presentation of Literature

This literature review begins with a short exploration of technology and its general effect on organizational structure. Beginning with the 'proverbs' of Herbert Simon, the relationship between technology and changes in the characteristics of organizations are discussed.

Information systems technology and the relationship between management information systems (MIS) and organizational characteristics is introduced. The widespread and expanding use of management information systems (MIS) in both the public and private sector is reviewed through changes to organizational decision making. These changes are defined by the amount of centralization, decentralization, or a combination of both with moderating influences. Next, the concepts of supervisory span of control and vertical complexity are introduced and examined in relationship with MIS.

The review of related literature concludes with an examination of information systems impacts on organizational structures. Robey's distinction between organizational impact and implementation are discussed as well as Drucker's prediction concerning the coming of the new organization.

## Technology and Organizational Structure

Introduction. Organizational change has been a topic of interest for researchers of MIS, administration, and organizational development. Organizations are 'open systems' which interact with the environment's external and/or internal pressures by altering such things as structural characteristics or decision making style (92:966). Structural characteristics (such as span of control or vertical complexity) are often interrelated, with changes in one inevitably leading to changes in others (97). For example, Simon suggested there is an inverse relationship between span of control and hierarchical levels, noting that restrictive span of control inevitably increases hierarchical levels whereas a shorter pyramid can only lead to increased span of control. He suggests an optimum point between two extremes (97). Blau and Scott, acting on Simon's challenge for further study, actually described a model for the mathematical relationship between number of hierarchical levels and span of control (11:168), with an inverse relationship:

$$S = \sqrt{\frac{L}{N}}$$

S = span of control

L = number of hierarchical levels

N = number of positions in the organization  
(11:169)

Pfeffer also used the model in a slightly different form (87:39-40).

Taylor has suggested that technology, i.e. the techniques and processes of changing materials toward desired ends or products, is a critical determinant of organizational structure (101) (102). Blau and others note that technological developments

....have stimulated the evolution of the modern economic organization, altered class structures, and affected political institutions. (12:20).

Harvey reported findings that show a clear relationship between organizational technology and organizational structure (52:256). Whisler hypothesized that technology has the capacity to modify organizational structure in a manner that is both systematic and predictable (113:33). Laudon concludes that, despite literature that 'is both vast and confused,' research seems to conclude that technology impacts the modern organization (74:23).

Joan Woodward. The earliest typology of organizational technology (27:260) and considered one of the pioneering attempts to examine the structural implications of technology (12:20), was the work of Joan Woodward (116). She concentrated her research on the organizational structure of 100 British manufacturing firms and attempted to

determine whether basic structural characteristics, such as administrative ratio, span of control, formalization, centralization, and number of hierarchical levels reflected similar management practices across organizations. (27:260)

Woodward identified three types of manufacturing technology, Batch/Unit, Mass Production, and Continuous Production, with parallel increases in technical sophistication and difficulty. She related these to specific organizational characteristics and noted that, for example, 'the number of levels in the management hierarchy, the span of control of first-line supervisors, and the ratio of managers and supervisors to other personnel were all affected by the technology employed' (51:64). Table one depicts some of Woodward's results.

Table 1. Woodward's Technology Framework and Organization Structure/Excerpts (27:261)

MANUFACTURING TECHNOLOGY (COMPLEXITY)	FORMALIZATION	SUPERVISORY	
		SPAN OF CONTROL	LEVELS IN HIERARCHY
Batch/Unit (Low)	Low	23	3
Continuous (High)	High	15	6

As the level of technology increased, the levels of hierarchy increased in a linear fashion but the span of control behaved in a curvilinear manner (85:86), i. e., increasing as technology grew from low to medium, then decreased as the technology became high. (118:65).

Woodward's findings show systematic differences in structural characteristics linked with technology. She felt 'Different technologies impose different constraints on individual members of organizations and on the choice

of organizational structure' (116:19), and '....those firms in which structure matched the technological requirements tended to be more successful than those in which structure did not match technological requirements as well' (88:242).

The Aston Studies. In an expansion of the Woodward study, the Aston studies developed a scale for classification that incorporated technology in nonmanufacturing (service) organizations. The Aston studies (55,90) supports Woodward's findings that structure was related to technology, but they incorporated an additional factor into the relationship: size of the firm (12:20) (27:264). Woodward's manufacturing firms were somewhat larger (27:264), leading Hickson and other to write:

The smaller the organization, the more its structure will be pervaded by such technological effects; the larger the organization, the more these effects are confined to variables....linked to the workflow itself and will not be detectable in variables of the more remote administrative and hierarchical structure (55:394-395).

Despite these differences, both Woodward and the Aston studies firmly established that organizational characteristics change with technology and served as a basis for a continuing '....debate between the proponents of size and technology as prime determinants of structure [which] remains largely unsolved' (12:20).

Related Research. Zwerman examined 55 Minnesota firms and reported findings which support Woodward (118).

Span of control of chief executives, ratio of non-supervisionist to supervisory personnel, and

number of levels in management hierarchy were found to vary directly with increased technological complexity. The differences observed were greater when only the very successful firms were compared with one another. (118:90)

The only contradiction to Woodward's findings Zwerman reported was first-line supervisor's span of control which did not vary as a result of production technology (118:90). Meyer examined the impact of the introduction of automation in the administrative sections of several government finance departments (84). He reported more levels of hierarchy and wider span of control for first-line supervisors as a result of simple knowledge technology (51:66).

Research has shown that classifying specific departments of an organization based on technology is possible. For example, individual departments of governmental agencies differ systematically based on technology (27:253). Hall supports this concept, noting 'It is thus very possible....that each of the various segments of an organization can have a structure quite different from those of other segments....Analyses of intraorganizational structural variations empirically verify that different units of the same organizations have different structural forms' (51:67).

Charles Perrow. Perrow 'made technology the basis of his theoretical scheme for analyzing structure' (88:243) but focused on the sub-organization (department/branch).

He dealt with task uncertainty, variability, and unpredictability and felt

If the task is analyzable and stable, and less differentiated, more centralized structural arrangements can be employed. Uncertainty in the technology affects organizational structure through its impact on the control process. (88:243)

Perrow noted 'This analysis made it possible to divide organizations into four types....and allowed us to make some complex predictions regarding the structure of these organizations' (85:90-91). Perrow's department classification model divided technology into four categories (routine to nonroutine) and related them to various structural characteristics. Table two gives a sample of Perrow's findings regarding structural characteristics. Perrow's model measured technology and determined the extent that technology permeated specific organizational departments. This allowed for further classification of the departments as needed.

Table 2. Perrow's Relationship Between Department Technology and Organization Structure (27:256)

<u>DEPARTMENT TECHNOLOGY</u>	<u>FORMALIZATION OF STRUCTURE</u>	<u>DECISION MAKING</u>	<u>COMMUNICATION</u>
Routine	High	Centralized	Infrequent Written
Craft	Moderate	Some Decentralized	Occasional Verbal
Engineering	Moderate	Some Decentralized	Frequent Written
Nonroutine	Low	Decentralized	Frequent Written/Verbal

James Thompson. In an attempt to "... go beyond Woodward by developing a technology typology that encompasses all organizations" (51:64), Thompson categorized organizational departments according to technical sphere. His tri-part technology ratings are summarized in table three.

Table 3. Thompson's Technology and Interdependence Framework (27:270)

<u>TECHNOLOGY</u>	<u>INTERDEPENDENCE</u>	<u>COMPLEXITY</u>	<u>COMMUNICATION</u>
Mediating	Pooled	Low	Low -- Vertical
Long-Linked	Sequential	Medium	Medium -- scheduled meetings, feedback
Intensive	Reciprocal	High	High -- unscheduled meetings, horizontal

A mediating technology joins clients with the firm and is characterized by pooled interdependence (27:269). For example, a commercial bank joins depositors with borrowers but each department (savings, investments, loans, and real-estate) are separate units that work independently of each other (104:16). A long-linked technology refers to successive stages of production, such as an assembly line, with each stage using production of the preceding stage and producing materials for the next stage. It is characterized by sequential interdependence (27:269), involving the coordination of several department's



activities to insure efficiency (104:15). An intensive technology is based on highly specialized skills and is characterized by reciprocal interdependence (27:269). For example, a hospital has many highly technical departments, all of which are involved in the patients treatment. This is the hardest type to manage because of the continuous interaction involved (104:17-18).

Thompson noted that most organizational tasks are divided into small components, resulting in differentiation of departments and individual roles with the organization. He writes:

While this specialization is beneficial for increasing efficiency, and perhaps even necessary considering the limitations on individual cognitive capacities, the differentiated parts of the organization must be coordinated in order to successfully accomplish the task. (88:243)

One way to ensure this coordinated behavior among elements was in the control provided by the organizational structure

The Systems Approach. A general systems approach definition of technology is 'the organizational process of transforming inputs into outputs' (21:248,47:533).

Representative of this is Khandwalla's conceptualization of the three aspects of work, as cited in Carter.

Khandwalla distinguished the following:

- a) work flow -- the way in which programs, activities, and events in the input-process-output cycle of the organization are sequenced;
- b) operations technology -- the role of mechanical aids in transforming inputs to the work flow into the outputs of the work flow;

c) information technology -- the role that mechanical aids play in transforming information inputs into information outputs. (21:248)

Carter expanded Khandwalla's three aspects of work model by incorporating computer technology into each of the three components. She writes:

When the computer has been included in this model, its use generally has been seen in information technology and, to a much lesser extent, as part of operations technology. It is easy to speculate, however, given the touted potential of the computer, how computerization could be the predominate means of work accomplishment. (21:248)

The first aspect of work, 'work flow', could be exemplified by 'the optimal sequencing of programs and activities [that] can be planned as well as executed through the use of the computer' (21:248). Similarly, computerized operations technology is 'the mechanical means of transforming inputs into outputs, whether directly -- that is, paper processing is the outcome -- or indirectly as it 'drives' other machinery' (21:248). And finally, the third aspect of work 'can act as the central component of information technology, transforming information inputs into information outputs' (21:248-249)

It has been noted that computers cause organizations to become white collar factories (15:27). Such impact is not limited to operations technology within manufacturing but includes general information systems technology. The next section will examine this concept.

## MIS and Organization Structure

Introduction. Early studies demonstrated the value of empirical research on manufacturing technology within the business/production arena and served as a model for the inclusion of information systems technology in the research effort. Khandwalla's three aspects of work, as expanded by Carter, assessed computer influence on organization structure but provided mixed results; impact on decision making was directly related to specific tasks but moderated by organizational size (21:266). This was not surprising. Blau and others noted that research on MIS technology and organizational structure follows a strikingly similar course to research on production technology with 'impressionistic observations preceding more systematic comparative efforts and yielding inconsistent findings and disagreements' (12:21). 'Although the speculative literature regarding computer effects on organizational structure is vast,' Robey adds, 'the basic positions are represented best by a few writers' (92:964).

Despite this inconsistency, MIS can affect future organizational structure (32:357). The interdependence between the two is so tightly coupled that, as the systems evolve, a diagram drawn to reflect an organization and a diagram drawn to reflect its MIS will ultimately be interchangeable (6:268).

Research into the effect of MIS on organizational structure largely focused on the issue of centralized or decentralized decision making (70:488). Robey delineated the following four positions based on this research:

- a) computers lead to greater organizational centralization;
- b) computers lead to greater decentralization;
- c) computers have no effect on organization structure;
- d) the computer's impact on structure is moderated by other influences. (92:964)

These issues will be addressed in turn.

Centralization. Centralization is defined as the distribution of power within organizations (51:114) and is characterized with the hierarchical level where decision making occurs. For example, top level decision making is indicative of a highly centralized organization while middle level decision making denotes decentralization (51:114-115). Davis and Olson depicts this relationship in the following manner:

A flat hierarchy with a wide span of control is more likely to be associated with decentralization of authority and decision making; a tall hierarchy with narrow span of control is likely to be associated with centralization. (32:335)

Research indicates that information systems technology may impact this association.

Early arguments tended to link computerization with an increase in centralization and were best exemplified by the prediction, first made by Leavitt and Whisler, that information systems technology has the greatest impact on

middle and top management (75:41). They reasoned that information will now move swiftly move up the organizational hierarchy, thus allowing for decisions to be made with a more global perspective. Thus, the computer represented the antithesis of decentralization (92:964). Leavitt and Whisler were among the first to use the term information technology when they wrote:

- a. Information technology should move the boundary between planning and technology upward.
- b. Organizations will recentralize and top management will take on an even larger proportion of the innovative, planning and creative functions.
- c. Middle management will radically reorganize and split, moving both upward and downward in status.
- d. The distinction between top and middle management will become even more crystallized. (75:42)

Middle management would be replaced with information systems that would monitor the environment and differentiate between routine and exception decisions. Routine decisions would be executed by the computer and exceptions would be passed to top management for action (70:489). Leavitt and Whisler's predictions were strongly criticized through the 1960s, 1970s, and early 1980s (2:128). Applegate and others feel 'Leavitt and Whisler were wise to believe that information technology would influence the structure of organizations, the management processes, and the nature of managerial work' (2:136).

Mumford and Banks supported Leavitt and Whisler's prediction that information systems would alter the decision making process, leading to reduced middle

management, a flatter hierarchical pyramid, and wider span of control for top management (5:1188). This is primarily due to a lessening of continuous interaction with subordinates (80:174). Ein-Dor and Segev, investigating variables affecting the success of MIS, noted that organizational structure is an uncontrollable variable and propositioned that success is more likely in centralized organizations (41:1069). They further hypothesized that more centralized organizations tend to have centralized MIS structure (40:57). Downs, in an examination of early MIS within the public sector, noted

City planners and budgetary officials will both eventually espouse centralized data systems. They will view such systems, at least in part, as means of gaining control over information channels vital to all operating departments -- and thereby capturing some of the latter's power. (35:208)

Centralization often results from the traditional tendencies of organizations to consolidate computer operations for economic reasons (63). Therefore, by centralizing the processing and storage of important information that could be used for decision making, the process of centralizing decision making would be easier to accomplish' (70:489). However, King cautions 'The experience in large organizations over the past two decades suggests that decentralization entails organizational changes that are likely to prove costly....' (63:333).

A reduction of middle management positions after MIS implementation is reported in the life insurance industry (111) and in manufacturing (58). Reif reported greater centralization in a utility company and a commercial bank, although most decisions at the bank were made by top level management (91:110). He writes, 'Under these conditions, the computer did not appear to be starting a move towards greater centralization. On the other hand, no evidence was found which might indicate a trend towards greater decentralization' (91:86). Delehanty reported results similar to Reif in nine life insurance firms and noticed a centralizing trend in relationships between home and field offices but none elsewhere (34:91).

The hard fact is that very few decisions of any significance have been made below the very top echelons. Therefore, one could not expect to find much recentralization since there had never been much decentralization. (34:90)

However, centralization could lead to loss of management control unless some counter-mechanism is established (1:344).

Whisler felt 'The current impact of information technology is to centralize the control structure in organizations or in the parts of them to which it has been applied' (112:47) and 'Increased centralization becomes almost irresistible as more computers are used by more organizations (113:62). Carroll, writing in 1967, felt 'the years that have intervened since the first prophecies

of Leavitt and Whisler...have provided little basis for disagreement with their prophecies' (20:162). Applegate and others support this, noting that 'As the 1980's draw to a close, [Leavitt and Whisler's predictions] don't seem so farfetched. In fact, they seem downright visionary' (2:128).

Decentralization. The opposite viewpoint was taken by researchers who felt that decentralizing mechanisms, such as distributed personal computers, time-sharing systems, and networks, would not replace middle management. Instead, decision authority would be delegated downward as information became more widely available and middle managers would exploit the opportunity provided by the technology. Middle management would eventually grow to handle decisions formerly belonging to top management (70:489).

Information technology can be used to support 'horizontal management,' i.e., the management of peers, using techniques of persuasion rather than leadership and supervisory skills. Tsaklenganos, a strong proponent of this management style, notes 'Horizontal management implies decentralization. This simply means that lower management must have the ability and authority to make and implement decisions' (105:33). It stresses cooperation gained by horizontal communication and information flow.



A detailed examination of public and private sector organizations concluded that, although the organizational environment can influence centralization of data processing services (82), 'broad organizational centralization does not seem to be occurring because of the computer' (115:127). Automation caused large, centralized information files which made company-wide data, heretofore available only to top management, at the disposal of middle managers (12:36).

In the past, where the availability of information paralleled the hierarchy of the management structure, authority for originating change was necessarily concentrated at the top. Now with equal information facilities available at all levels of management, authority for originating change is likely to be found where the idea is found, whether this be at the lowest or the highest level. (115:201)

In addition, the sheer volume of data output overwhelms top management and actually encourages middle management to use their decision-making capability (12:36).

These two points, a large volume of data often concentrated at the top, causes a fear that

While many executives believe fundamentally in the idea of decentralization, some still have lingering doubts about their ability and the ability of their staff offices to control effectively a decentralized operation. (110:25)

To avoid this fear, and the resulting cyclical decentralization-recentralization problem, Wagner suggested continuous monitoring of conditions which '....reflect in a significant, quantitative manner the effectiveness of decentralized units in contributing to over-all corporate objectives' (110:25).

Pfeffer and Leblebici obtained results which directly contradicted Whisler's 1970 study. They found a positive statistical relationship between information technology and both the amount of decentralization and the number of hierarchical levels (88:258). Although they feel that information technology is a suitable substitute for control mechanisms based on human intervention (88), decision making is delegated

only to the extent required because of information-processing limitations or other constraints, and is quickly recentralized...when the information-processing or other constraints can be overcome. (87:53)

MIS usage has been related to the degree of centralization/decentralization measured. Klatzky found office automation

had a strong positive effect on decentralization ....Automation has this effect in that it reduces routine problems at the lowest level of the organization. This frees first-line supervisors from some of their day-to-day problems and allows them to accept the responsibility for decisions which had been forced back up to higher levels in the hierarchy. Each level is, in turn, freed from its more routine tasks; and the process repeats itself on up to the director.... (66:149)

Information technology increases both upward and downward information flow, thereby allowing decisions to be made further down the hierarchy. The quality of the decision will improve if it is made closer to where the problem exists, especially if supervisors are provided additional data from above. (3) (18)

Blau and Schoenherr produced the strongest evidence for decentralization in The Structure of Organizations

(10) by identifying two principles that affect decision making responsibilities:

- a. Administrative pressures engendered by a large volume of managerial duties and a complex structure exerts constraints to decentralize decisions, whether top executives will it or not.
- b. Top management seeks to minimize the risk excessive variability poses for large-scale administration by delegating responsibilities to middle managers. (10:136)

A 1976 study by Blau and others will be examined in the next chapter but concludes

that on-site computer use is associated with decentralization of operational decisions supports Withington's predictions and contradicts those of Whisler and others. (12:37)

To summarize, as computer utilization increases, particularly in mid level activities, organizational decision making will become more decentralized (21:251).

No Impact/Moderating Influences. "In all the writings about computers," Robey muses,

few have taken the position that computers do not affect organization structure. Yet this view should be included and actually becomes a rather viable position when the morass of conflicting research and speculative writing on the subject is reviewed. (92:965)

An example of this position is included in research on four public sector MIS in the areas of social services and law enforcement. Two systems resulted in centralized bureaucracies, one system resulted in decentralization, and one showed no significant change (74:64). In another case, a study of various British industries reported only one organization, out of ten, that showed any change in

the amount of centralization/decentralization (99:226). In an extensive examination of the social aspects of computing, Kling summarizes the empirical research findings of no major structural impact on the modern workplace (67).

Researchers predicting moderation view the computer as a flexible tool that assists management in creating an appropriate organizational structure, based on various other conditions (92:965). Kanter notes:

The conclusion is that the computer does not affect the major reasons for adopting the decentralization concept. Thus it does not have a major impact on whether a company centralizes or decentralizes.... Although not the major determinant of whether a company centralizes or decentralizes, the computer is an aid in proceeding along either route. (92:965)

Davis and Wetherbe felt

organizations will become increasingly dependent upon data processing in every aspect of business life...., [thus] 'networks of data processing systems will evolve with some applications centralized and some decentralized based upon the specific requirements and management strategies for specific organizations' (31:51)

Kraemer and King, noting the context of the MIS use is a stronger influence on decision making than mere technology, write:

the technology supports either arrangement; which arrangement is followed in any particular instance is a function of organizational history, management, and politics. (70:489)

In essence MIS implementation results in two possible organizational scenarios: the first scenario is based on centralized control and an integrated information system;

the second has a "traditional" (decentralized) decision making structure and heterogeneous information system. Understanding these scenarios is a tool for understanding MIS impact (89:19).

Centralization and decentralization have been simultaneously reported in the healthcare industry (48), in international organizations in Greece (4:201), and in the British rail industry (33:129). Dawson and McLoughlin reported both centralization of control for strategic decisions but delegation of responsibility for day-to-day decisions to local areas from divisional level (33:129). They argue that centralization/decentralization are not simple dichotomies but involve broader choices.

To understand this, supervision needs to be seen as a system of control comprised of a number of supervisory roles, formally and informally defined, and concerned not just with the direct control of labour but with the day-to-day control of production as a whole. (33:129)

Howe and Oestreicher, in a similar examination of centralization/ decentralization and corporate strategies, presents examples of organizational structures that are applicable for either approach (57). They feel actual structure is not an important factor.

Once a corporate MIS approach is determined, an organizational structure can be developed that supports the MIS and corporate management approach. There is a wide variety of structures that can be adopted, dependent upon whether your healthcare institution has decided to design the organization in a centralized or decentralized manner. (57:24)

In Reif's case study of three firms, he reported evidence of centralization associated with computerization at two of the cases, an electric and gas utility and a commercial bank, but decentralization at the third case, a heavy equipment manufacturer (91).

Why is there this dichotomy of results with much of the research diametrically opposed to each other? Emery feels part of the problem is a definition of terms:

One reads arguments to the effect that computers will lead to decentralization because they will allow top management to monitor more closely the operations of lower-level management. If close surveillance serves any purpose at all, this means that top management will be in a position to judge the detailed actions of subordinates. Presumably, a lower-level manager can exercise freedom of action as long as he takes the right actions as judged by his superiors. It seems to me that any reasonable definition would have to include such Orwellian surveillance as an aspect of centralization. (42:159)

Another explanation is that 'those studies dated after 1970 tend to support the trend towards decentralization; those dated prior to that time favored centralization' (21:251).

Daniel Robey, a strong proponent of the moderating influence of MIS on organization structure, participated in a study of eight international organizations and examined the effect of MIS on structure (9). The specific findings of this 1981 study will be examined in the next chapter but do indicate 'little uniformity in the way that information systems mesh with formal organization structure' (93:686).

Span of Control/Vertical Complexity. Luther Gulick,  
an early public administration theorist, philosophized  
just as the hand of man can span only a limited number  
of notes on the piano, so the mind and will of man can  
span but a limited number of immediate managerial  
contacts. (50:42)

Although efforts to operationally define span of control  
have been attempted, the exact ratio remains a matter of  
debate. Van Fleet and Bedeian's historical study noted  
Napoleon had a maximum span of control for his military  
leaders as five, while Clausewitz expanded this to ten  
(107:357-359). The average span of control in the United  
States is ten subordinates whereas Japanese managers have  
anywhere from 100 to 200 subordinates (86:356). Peters'  
recommendation for the organizational structure of the  
future is:

Three layers, supervisor (with the job redefined to  
deal with a span of control no smaller than one  
supervisor for twenty five to seventy five people),  
department head, and unit boss should be tops for any  
single facility such as a plant or operations or  
distribution center (86:359).

Literature has recommended spans of control between three  
and nine subordinates, although this can be expanded up to  
thirty at the transaction level (103:7-8).

Research has supported Simon's original 'proverb' that  
the number of hierarchical levels is related to the span  
of control (113) (118). Whisler concluded 'it is simply  
a matter of organizational geometry that, when the span  
of control declines, the number of levels will have to

increase, barring any change in the number of people involved (111:56).

The concepts of span of control and vertical complexity provide a key illustration of classical management theory and link centralization/decentralization to the examination of structural characteristics. For example, Woodward's studies (116) showed the effect of technology on several organizational characteristics, including span of control and levels of hierarchy, and influenced further organizational research. Indeed, Withington felt one of the primary reasons for decentralization

has been the inability of central management to control the details of a large enterprise. Only by splitting an organization into units small enough to fall within a single manager's span of control can detailed operations be satisfactorily managed. (115:119)

Davis and Olson note, "The information processing load imposed on an executive by these and other [decision-making] activities is the major element affecting the span of control that an executive can effectively exercise" (32:341).

Empirical research has suggested that implementation of MIS has an effect on supervisory span of control and hierarchical levels (10,12,111,113), but the direction of the effect is debatable. Lucas, in 1973, noted "There is no reason why computer systems should result in a drastic change in the number of levels of management. However,



some changes in the composition of departments and the relationships between them should be expected" (76:246). Danzinger and Kraemer feel such changes are limited within public organizations (30) (49). On the other hand, research reported both a marked decrease in the number of clerical staff and the elimination of an entire hierarchical level (99:225), an increased span of control for first line supervisors & decreased span for higher level managers (45:102), and decreased middle-management discretion and authority (8:218-219).

In an examination of potential impacts of office automation on organizations, Olson and Lucas proposed that "Automated office systems can be utilized to help increase the span of control of managers" (83:844). They note that information technology may increase the efficiency of office functions which should result in more free time for the manager. Some companies elect to fill this free time by "....increasing the number of subordinates reporting to a manager [which] has the distinct advantage of being quantifiable in terms of a reduction in the total number of managers required" (83:844). One such company was Citibank which, in 1976, used information systems technology as a tool to increase the front-line service staff without increasing the number of managers. The increased load on the manager can be seen as a justification for the MIS (19:3). Vergin noted such

structural changes are often a factor of the sophistication level of decision models. He writes, 'As more decisions are shifted from managers to computers, the manager will be able to increase their span of control and administer larger, more complex units' (108:183). Power supports this by predicting increased span of control because of less decision makers and support staff (89:18). An early study on electronic data processing and local governments predicted significant increases in supervisory span of control (29:33).

Whisler, in an examination of electronic-data-processing (EDP) systems within the insurance industry, noted evidence of decreases in both span of control and hierarchical levels among companies following implementation of the system (111). Data was obtained through examination of organization charts or respondent's perception estimates. Respondents either provided data for the entire firm or by department. Tables four and five summarize:

Table 4. Whisler's Effect of EDP on Average  
Span of Control as Determined from Three  
Different Sources of Information.

Information Source	Span Of Control					
	Decreased		Increased		Stayed Constant	
Examination of organization charts of EDP-affected departments (n=48)*	19	(40%)	15	(31%)	14	(29%)
Estimates from 10 companies (n= 10)	3	(30%)	0	(0%)	7	(7%)
Estimates from 10 companies for EDP-affected departments, separately (n=98)**	44	(45%)	29	(30%)	25	(25%)

\* These departments are in the same companies that provided estimates.

\*\* One group of 10 companies (113:44)

Table 5. Whisler's Changes in the Number of  
Organizational Levels in EDP-Affected Areas,  
reported by Department and Company.

Affect on number of levels	By Department	By Company
Decline	20	5
No Change	*	11
Increase	9	2

\* Due to ambiguous reporting; some companies indicated 'no change' without specifying number of departments. (113:41)

### Ideas for the Future

Cox, in an examination of MIS usage within organizations, notes

The structure of an organization, whether it is the result of a deliberate plan, or the outcome of years of spontaneous evolution, consists chiefly in the patterns of communication among its constituent groups and individuals. (24:5)

Since MIS has a significant role in the channels of communication within an organization, it is a key factor in effecting organizational structure.

Such issues can be structured into two broad areas, as defined by Robey (94): a) literature on MIS impacts, which is "...concerned with the changes that occur in organizations when computing is introduced," and b) literature on implementation, which is concerned with 'the best ways to get such systems introduced' (94:73).

Both areas basically concern the introduction of technical change into organizations. The implementation literature initially reflected a greater interest in the use of operations research studies and management science techniques... [However,] implementation is a process of managing the impacts of systems. (94:73,76)

Linking the two is imperative for accurate research.

Robey's solution for doing this is through what he terms development history.

Future MIS research should attempt to explain how systems were implemented. Robey writes,

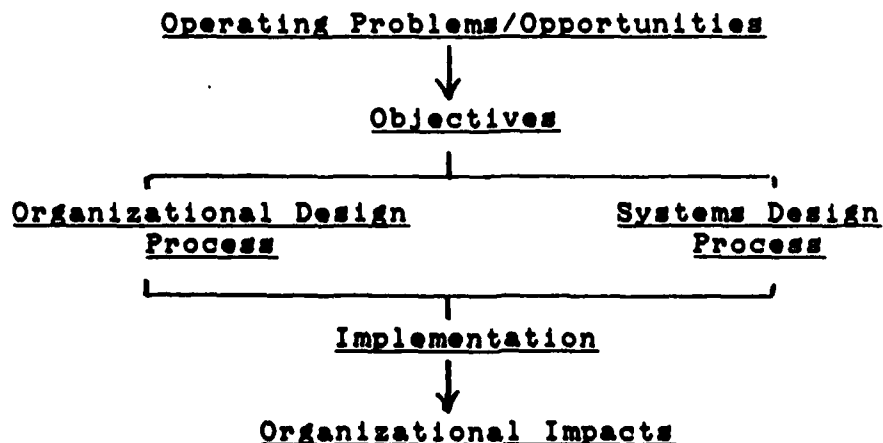
Only if we know why and how the system was developed and what meanings the participants attribute to the system can we understand the impact of the system on the organization. I use the term development history

to indicate the process by which a system is proposed, designed, implemented, and used in an organization... Understanding a system's development history includes but is not limited to its implementation. (94:73).

It is critical that impacts, such as organizational structure changes, communication patterns, and inter-organizational relationships, be anticipated and managed through the process of implementation.

Since most impacts are largely accidental within organizations, Robey designed a model that incorporates both technical and organizational changes in measuring impact following implementation. Since the two changes often evolve separately, use of the model helps 'ensure that the systems solution and the organizational solution are compatible' (94:83) and unmanageable accidents are avoided. Table six illustrates Robey's model.

Table 6. Robey's Model for Managing Information Systems Impacts. (94:77)



Parallel study of the organization design and systems design processes is the key to insuring compatibility.

The value of such techniques becomes more visible when, as Drucker terms it, the "information-based organization" is considered (36:45). Drucker notes

The typical large business 20 years hence will...bear little resemblance to the typical manufacturing company, circa 1950, which our textbooks still consider the norm. Instead it is far more likely to resemble organizations that neither the practicing manager nor the management scholar pays much attention to today: the hospital, the university, the symphony orchestra. For like them, the typical business will be knowledge-based, an organization composed largely of specialists who direct and discipline their own performance through organized feedback from colleagues, customers, and headquarters. (36:45)

He predicts changes to vertical complexity and span of control because "...whole layers of management neither make decisions or lead. Instead, their main, if not their only function is to serve as 'relays'" (36:46).

The changes Drucker speaks of reflect the general consensus that MIS may change organizations through "...a rearrangement of organizational structures into shapes that are not as yet obvious" (45:89). These changes can be major or minor (108:183), they can occur in the private sector (12), the public sector (28) (30), or sometimes not at all (93), but they do merit study and research.

### III. Methodology

#### Introduction

This chapter examines the methodology used to answer the research question. The overall structure of the methodology is a synthesis of four previous research efforts, which will now be examined. The Bjorn-Anderson study served as an inspiration for this thesis effort and was heavily drawn upon by this researcher.

The Clowes Study. Clowes' 1982 study, The Impact of Computers on Managers, '....focuses on managers' perceptions of their important work activities and various impacts of computers and information systems' (23:1). Clowes identifies a series of twelve research propositions which focused on managers' perceptions of computer impacts.

The methodology utilized was a questionnaire distributed to managers of 28 Canadian manufacturing firms and personal interviews with selected managers.

Clowes notes:

The 355 questionnaire respondents and 166 interviewees who participated in this study represented all major functional areas of operations in subject organizations, all three of the managerial reporting levels selected for inclusion in the study and both line and staff positions. The large number of questionnaire respondents resulted in all of these situational categories being reasonably well represented by a large number of individuals. (23:66)

No percentage of respondents to total surveys mailed out was given but Clowes appeared satisfied with his response.

Some of the results of the study showed "....a number of significant relationships between both managers' computer impact and work activities perceptions and the levels of information systems development in organizations" (23:86). The study also supported the proposal, first made by Whisler (113), that "....the mix and variety of senior managers' work activities have increased in organizations that introduced computers (23:87). Clowes concluded

The major barriers to effective information systems development in organizations were, are, and will continue to be behavioral in nature. The purpose of this study has been to investigate a number of these behavioral issues. In particular, managers' perceptions of their work and of the impact of computers on their work have been studied in relation to the nature of their organizations, their situational roles, and the extent and quality of information systems in the organization. (23:93)

The idea of supervisor's perceptions used by Clowes plays a major role in this present thesis as well.

The Reif Study. An early attempt "....to examine what structural changes occur following the implementation of computer systems in business organizations" (91:41) is Reif's 1968 work Computer Technology and Management Organization (91). The concern of this research included the hierarchical level at which decisions are made, the formal and informal channels of communication, and the functional integration of organizational activities and its impact upon the traditional structure of business organizations. (91:41)



The methodology selected by Reif was the case study method because

"....it is necessary to observe and identify the organizational changes which take place within business firms before normative statements are made as to the type of structure which permits the most efficient utilization of computers and information technology....This provides the investigation the opportunity to view organizational change as a process of adaptation and it permits the researcher to examine in a given situation all the factors which have a bearing upon the problem under investigation. (91:42)

Sources of the data came from three firms: a utility company, a bank, and a manufacturing firm. In selecting the participating firms, Reif followed three criteria:

- a. The firms must reflect a cross section of business experience and computer application.
- b. The firms must be of varying sizes.
- c. The firms must have adequate (defined as two or more years experience) with computer systems. (91)

Personal interviews, both structured and unstructured utilizing both formal and informal techniques, were used. Company records were used whenever possible. (91:43-44)

Reif related his results of organizational changes to their consequential effect on three areas:

- a. The locus of decision making,
- b. Line-staff relationships,
- c. The communications network. (91:91-108)

His findings indicate that computers have the effect of centralized decision making within the management hierarchy and formal channels of communication needed revision in order to provide "....management with the information necessary for planning, coordinating, and controlling organizational activities" (91:110).

Reif also predicted a reduction in the total number of departmental units within an organization, through consolidation and/or the elimination of duplicate staff effort. Finally, Reif pointed out that middle managers would be the group most affected by computers through a serious shift in job responsibilities and a reduction of actual numbers needed. (91:111-113)

The use of the case study method, involving personal interviews and company records to determine organizational change, served as a major influence in this present thesis.

The Blau et al. Study. A specific research effort forming a foundation for this thesis is the 1976 study by Blau, Falbe, McKinley, and Tracy, entitled "Technology and Organization in Manufacturing" (12). This article examined "the influence of technology on the structure of white-collar and blue-collar work ...in 110 American manufacturing establishments" (12:21). Technology was operationally defined as the "substitution of mechanical equipment for human labor" (12:21) and examines two independent variables, production technology and the automation of functions through computers. The first independent variable, production technology, refers to the degree of mechanization of manufacturing equipment on a scale ranging from powered machine tools (controlled by an operator) to computerized equipment (a robot). The second independent variable, automation of functions

through computers, deals with "the administrative support of production, as well as in marketing and distribution" (12:31). The departments examined included accounting, inventory control, sales, and production scheduling. The second independent variable applies directly to this thesis. Relationships between an independent variable (level of computer automation) and three dependent variables (structural differentiation, personnel components, and spans of control of supervisors) are measured using data obtained through interviews and questionnaires (12:22-24).

The results only partially support earlier research. For example, Whisler stated that computer use leads to a smaller number of hierarchical levels and a wider span of control on the lower supervisory level (111), while Withington felt an enlarged hierarchy with smaller spans of control was the inevitable result (115). Blau et al, note, "Contrary to Whisler's assumption...computer use tends to increase rather than decrease the number of administrative levels in the plant hierarchy" (12:32), depicted in Table seven, row 1. The results further indicate the introduction of MIS does narrow the span of control of chief executive officers, has little influence on division heads, widens the span of control of middle management (section heads), and narrows the span of control of first-line supervisors. Table seven summarizes:

Table 7. Blau's Measures of Association Between Dimensions of Structure and Indices of Technology.

<u>DEPENDENT VARIABLE</u>	<u>TOTAL COMPUTER USE</u>
Number of Hierarchical Levels	.27*
Span of Control	
Chief Executive Officers	-.19*
Division Heads	-.04
Section Heads	.23*
First Line Supervisors (all)	-.22*
* = significant at .05 level	
	(12:25)

The Blau et al. study was a major research effort to correlate computer usage and horizontal/vertical changes to organization structure. Although statistical analysis was heavily used, the study encouraged this thesis effort. Blau's results served as a basis of comparison with the results of this research.

The Bjorn-Anderson et al. Study. Another key research effort was a study by Bjorn-Anderson, Eason, and Robey entitled 'Managing Computer Impact: An International Study of Management and Organizations' (9). This study investigated eight organizations from Austria, Denmark, England, West Germany, and the United States. Described as a 'databased comparative case study' that looked at a 'variety of systems in a variety of settings' (93:679- 680), the project examined '...the impact of computer systems on individual managers and the management structure' (9:3).

The research population was deliberately varied to insure external validity and generalization but common selection criteria were used to insure standardization of the research. The selection criteria were:

- a. systems chosen were fully implemented for between one and two years.
- b. systems all support managerial decision making and are not just transaction, data processing systems
- c. impact of the system was felt across at least two functional areas of the organization. (93:680)

Data was collected through structured interviews and one self-completion questionnaire administered to a nonrandom sample of users representative of all department levels. Descriptive information about the computer system design process was obtained through unstructured interviews with developers.

The ideal research project would have consisted of extensive 'before' and 'after' analyses but this proved impractical. Therefore, the team was constrained to the assessment of change after the event (9:12). In order to properly assess this change, the individual team members

realized the practical impossibility of conducting eight parallel longitudinal case studies, although that design would have most accurately identified when changes occurred. Rather, we asked respondents to think retrospectively about changes brought about by the introduction of the computer. (93:680)

To avoid pressure on the respondents to 'find something that has been changed,' the authors "...found it desirable that request about change be made in a less direct manner and embedded in questions of other types" (9:12).

The general approach to questioning avoided vague or socially acceptable answers via the following approach:

- a. the respondent was asked to describe the existing situation (e.g., scope of task, amount of influence on decisions, channels of communication)
- b. the respondent was asked how the computer system changed the situation
- c. the respondent was asked to evaluate the change.  
(93:680-681)

No attempt was made to exclude changes caused by events other than MIS implementation. Given the constraints of the research, simple oral reports of change were relied upon mostly. The research team asked each respondent to specifically identify those changes resulting from MIS introduction.

The results of the study indicated little uniformity in the effect of organizational structure. The research found that:

- a. Information systems do not cause structural changes in organizations.
- b. Structural change may or may not accompany systems implementation.
- c. When it does, the changes in structure appear as consistent companions to either rational management objectives, political strategies, or both. (93:686)

The authors felt there were 'several different organizational structures compatible with computer information systems' (93:686).

This thesis is, essentially, a partial-replication of the Bjorn-Anderson et al. study. The authors used the case study method to measure the impact of MIS on horizontal and vertical organizational structure. Data

was gathered from unstructured interviews. The technical aspects of the study were best summed up by Robey who wrote,

Because of the nature of these data, no attempt is made to perform statistical analyses or to test hypothesis in the formal sense. We simply observed how the computer system affected formal structure. (93:681)

That philosophy permeates this thesis effort as well.

### MIS Impact on Military Organizations

The general approach to solving the research problem was the case study. The research design was ex post facto, which is defined by Emory as a design in which investigators 'can only report what has happened or what is happening' (43:60). The case study

attempts to capture the reality of a particular environment at a point in time. A particular subject, group of subjects or organization is observed by the researcher without intervening in any way. No independent variables are manipulated, no control is exercised over intervening variables and no dependent variables are measured. (61:14-15)

The negative features of a case study include having low external and internal validity, reliability, and efficiency. It does, however, have a high degree of naturalness, comprehensiveness, and behavior setting-dependence (7:53, 61:10-11). Emory further notes that 'ex post facto design is widely used in business research and often is the only approach feasible...The careful researcher using the ex post facto design should approach causal conclusions cautiously' (43:78). Therefore, this thesis only assumes the perception of causal relationships.

The research by Bjorn-Anderson and others illustrates an ideal environment for a case study and 'illustrates primarily the use of comparative qualitative case study methods' (93:680). This approach was described by Eason:

The problems of obtaining a meaningful, quantitative assessment of user performance can be insurmountable and there is a simpler way of obtaining interesting and valuable data. Indeed, when the system is designed to enhance the way people work and identify new ways of operating, this can be a superior technique. This method is to seek the perception of users of the changes that have taken place in the way they work and their assessment of whether these changes have been beneficial or detrimental. (38:194)

In this thesis, the investigative questions did specify quantifiable variables, but the information captured was based merely on the respondent's perception of change. Dutton and Kraemer also correlated perception of impact and degree of computing in their study of local government (37). Brannen noted perception is based on the managers evaluation of "...how the MIS will impact the organizational system" (17:235).

Many other 'causes' of structural change, such as altered mission, could be affecting the environment. However, as in the original Bjorn-Anderson and others study, no attempt was made to isolate these other 'causes.' Simple oral reports or the user's perception of change due to the effects of the MIS were gathered. (9)

Data for this research was obtained from three U. S. Air Force organizations located on Wright-Patterson AFB, Ohio. Resource constraints dictated that selected



organizations be located here. Selection criteria were based on the original MIS requirements of Bjorn-Anderson and others:

- a. Systems chosen were fully implemented for between one and two years
- b. The impact of the systems was felt across at least two functional areas in the organization
- c. The systems all supported managerial decision making; they are not clerical EDP systems.  
(93:680)

Organizations that have both military and DOD-civilian supervisors were considered.

Specific base organizations that met the selection criteria were determined through consultation with Communication/Computer Systems (SC) advisors. These individuals were queried using the MIS Implementation Interview Guide: Systems Manager (Appendix B) to gather appropriate data on possible organizations for further investigation. Once specific sites were determined, these individuals provided contacts and introductions. The specific sites, systems managers and office symbols, and management information systems were:

- a) 2750 Civil Engineering Squadron -- Mr. James Dawson (2750 CES/DEI) -- Work Information Management System (WIMS).
- b) 2750 Air Base Wing -- Mrs. Judith R. Cummins (2750ABW/IM) -- Base Headquarters Network System (BHANS).
- c) Air Force Logistics Command Material Management -- Ms. Patty Moore (AFLC/MMIS) -- Material Management Office Information System (MMOIS).

Data came from on-site interviews using structured questioning procedures based on Bjorn-Anderson and

others' change-assessment guidelines (9). The researcher personally interviewed 88 military and civilian supervisors from a cross section of organizational levels, in the following distribution:

- a) 2750 CES: 27
- b) 2750 ABW: 32
- c) AFLC/MM: 29

Respondents were selected from operational, tactical, and strategic decision making levels of Davis and Olson's management information systems hierarchy (32:7). Emory's techniques for successful interviewing were utilized, including a prearranged questioning sequence, interview guide, and allowance for bias (43:164-169). Before/after organization charts were utilized if available.

As in the Bjorn-Anderson study, respondents were asked to 'think retrospectively about changes brought about by the introduction of the computer' (93:680).

Respondents were queried on specifics through the following steps:

- a. The respondents were asked to describe the situation prior to implementation of the MIS. They were asked to specifically state how many individuals reported directly to them and how many hierarchical levels separated them from top decision makers and transaction processors.
- b. The respondents were asked to describe the existing situation, using the same types of questions as above.
- c. The respondents were asked how the computer system changed the situation.
- d. The respondents were asked to evaluate the change. (93:680)

The exact wording of the questions followed the MIS Implementation Interview Guide: Top-Level Management (Appendix C) or Mid-Level/First-Line Supervisors (Appendix D). These interview guides were constructed by the researcher from the sources mentioned at the beginning of this chapter. They specifically incorporated aspects of Van Fleet's research on span of management (106). Van Fleet points out the need for careful wording in order to achieve valid results. He notes, for example, the difference between the questions "How many people report directly to you?" and "How many people do you supervise?" Respondents could rationalize that "Only half a dozen people report directly to me but as Plant Manager, I supervise everyone in the plant" (106:547).

In the original study by Bjorn-Anderson and others, no attempt was made to perform statistical analyses or to test hypotheses in the formal sense because of the nature of the data. In fact, Robey pointed out, "we simply observed how the computer system affected formal structure" (93:681). This research replicated that effort by simply observing and reporting the effect, if any, of MIS on formal structures within military organizations.

## Conclusion

This thesis is, essentially, a partial-replication of the Bjorn-Anderson et al. study with aspects of other studies incorporated. Field interviews were conducted to determine the user's perception of MIS impact within their organization. The next chapter presents the results of these interviews.

#### IV. Analysis of Findings

##### Introduction

This chapter presents the results of the case study interviews. Although responses were varied, enough similarity existed to allow grouping of answers into clusters, thereby making it possible to discern patterns. Proportions of participants responding in a similar way will be reported and conclusions will be drawn from this.

The MIS background section will report specific information on each MIS; this information came from personal interviews with systems managers. Next, the results of common questions asked of top level management and mid level/ first line supervisors are examined. Interview questions that specifically answer the research questions stated in Chapter One are addressed. Finally, individual questions are discussed. Note: hereafter, top level management will be abbreviated TLM and mid level management/first line supervisors will be MLM/FLS.

##### MIS Background Information

This section provides specific background information on the three individual MIS investigated. Systems managers were interviewed using the guide found in Appendix A and appropriate documentation was examined.

The original selection criteria were not satisfied. The first criterion, fully implemented for between one and

two years, proved slightly difficult; WIMS is three years old, as is the present form of BHAN. Only MMOIS, implemented in 1987, met the timetable. All three MIS met the second criterion, system impact felt across at least two functional areas in the organization. The third criterion, supported managerial decision making (not clerical EDP systems), proved most difficult. All three MIS have the capability to provide decision support to management, but this function was not often used to full advantage by all management levels. A majority of participants use their respective MIS for both regular and ad hoc reporting (tables 24 and 25). However, the largest use of MIS was for electronic mail (table 14) with little report-oriented, decision-making functions utilized.

This is due, in large part, to training. Managers appeared to be aware of capabilities of their respective MIS but did not make use of available tools unless they were shown specific applications; there was little evidence of "playing with the computer."

Work Information Management System (WIMS). WIMS was originally introduced into the 2750 Civil Engineering Squadron in 1983 in an abbreviated version, replacing another automated system. The system in its present form was installed in 1986. WIMS is found in all eight branches of the organization with the two heaviest users (as defined by the systems manager) being the

Requirements and Logistics sections. There are 500+ access users but the systems manager estimated 100-150 regular users. Access to WIMS is somewhat limited (table 11) yet usage is fairly heavy, particularly among MLM/FLS (table 13). WIMS showed the highest number of interactions per workday among TLM (table 12) and the highest usage of reporting functions among MLM/FLS (table 14).

WIMS is a menu-driven MIS that appears to be "user-friendly," requiring a minimum of keystrokes. An example of a main menu for the Base Civil Engineer is found in Appendix F. Basic office automation features, such as word processing, electronic mail, calendar, and phonebook functions are available. In addition, a database is used to track current operations, future projects, and personnel data. Users can access such items as job order/work order information, vehicle data, and leave/TDY status through a report format. Appendix G is a sample of an emergency job order report. WIMS helps expedite a workload of 150 - 200 job/work orders per day.

Base Headquarters Automated Network (BHAN). BHAN was originally introduced into the 2750 Air Base Wing in 1984 in a scaled-down version, replacing a manual system. The BHAN system evolved into its present form by 1986, but is constantly adding more functions and users. At present, there are 350+ users found in nearly all divisions.

BHAN is defined by the systems manager as a wide-area network primarily for office automation. It appears to be a popular system with unlimited access and constant usage (tables 11-13) and high ratings for 'usefulness' and 'time-savings' (tables 20-23). BHAN includes a myriad of features, such as word processing, electronic mail, calendar, spread sheet, graphics, and a limited database. Appendix H is a sample of an equipment inventory roster.

Material Management Office Information System (MMOIS). MMOIS for HQ AFLC/Material Management first appeared as a prototype in 1985 and reached its present format in 1987. Six of 13 departments of the organization have access to MMOIS; approximately 400+ users.

MMOIS tracks project status, such as milestones planned and completed, and provides this information to management in report format. The reporting features of MMOIS, both regular and ad hoc, were utilized most (tables 24-25). Appendix I is a sample template of one format used for the reporting function. MMOIS also functions as an office automation system, featuring electronic mail, suspense tracking, and phone rosters. MMOIS has spreadsheet and graphics capability.



### Responses to Common Questions

This section summarizes answers to common questions asked both levels of participants. There were a total of 88 participants in this research in the following mix:

Table 8. Number and Level of Participants

<u>LEVEL</u>	<u>WIMS</u>	<u>BHAN</u>	<u>MMOIS</u>	<u>TOTAL</u>
TLM	4 (4.6%)	11 (12.5%)	7 (7.9%)	22 (25.0%)
MLM/FLS	23 (26.1%)	21 (23.9%)	22 (25.0%)	66 (75.0%)
-----				
TOTAL	27 (30.7%)	32 (36.4%)	29 (32.9%)	88 (100%)

Background Information on Participants. Specific demographic information (job title, job description, length of time on job and in organization) was gathered.

TLM consisted of senior level executives, such as Vice Wing Commander, Comptroller, Deputy Civil Engineer, Director of Personnel, and Base Information Manager. Job descriptions consisted of general responsibility for a particular unit of an organization. Composition of the MLM/FLS group was varied, including such job titles as Unit Foreman, Division/Section/Branch Chiefs, and First Sergeant. Job description focused on specific responsibility for a particular sub-unit within an organization. Assignment times are summarized as follows:

Table 9. Average Length of Time on Job  
in Years - (Number of Civilians/Military)

LEVEL	WIMS	BHAN	MMOIS	TOTAL
TLM	5.3 (3/1)	1.9 (7/4)	1.5 (5/2)	2.9 (15/7)
MLM/FLS	2.3 (21/2)	3.4 (16/5)	2.0 (20/2)	2.5 (57/9)

Table 10. Average Length of Time in Organization  
in Years - (Number of Civilians/Military)

LEVEL	WIMS	BHAN	MMOIS	TOTAL
TLM	17.2 (3/1)	5.0 (7/4)	7.3 (5/2)	9.8 (15/7)
MLM/FLS	9.4 (21/2)	6.4 (16/5)	9.4 (20/2)	8.4 (57/9)

The average length of time is unusually long for military organizations due to the high percentage of civilians within each organization (15 of 22 or 68.2% of TLM and 57 of 66 or 86.7% of MLM/FLS). For example, one top level manager has held the same job since 1973.

Please describe your access to the MIS. For example, is it very restrictive or unlimited? How often do you use the MIS? The purpose of the two questions was to get a general impression of the participant's accessibility to and use of the MIS. Answers generally fell into three categories: unlimited access, limited or shared access, and never use the MIS. Access is summarized as follows

Table 11. Access to the MIS

LEVEL/RATING	WIMS	BHAN	MMOIS	TOTAL
TLM (UNLIMITED)	3	11	5	19
TLM (LIMITED)	0	0	2	2
TLM (NOT USED)	1	0	0	1
-----				
TOTAL	4	11	7	22
-----				
MLM/FLS (UNLIMITED)	8	17	22	47
MLM/FLS (LIMITED)	12	3	0	15
MLM/FLS (NOT USED)	3	1	0	4
-----				
TOTAL	23	21	22	66

All three MIS appear to be accessible to both levels, the only exception being the limited access of WIMS to MLM/FLS. 19 of the TLM participants (86.4%) said they had unlimited access with a terminal on their desk, 2 (9.1%) described access as limited, and 1 (4.5%) never used it. Within the MLM/FLS group, 47 (71.2%) said they had unlimited access, 15 (22.7%) described access as limited, and 4 (6.1%) never used the MIS.

Some participants described their MIS usage in terms of numbers of interactions per workday, summarized below:

Table 12. Average Number of Interactions per Workday

LEVEL	WIMS	BHAN	MMOIS	MEAN
TLM	12.0	7.5	5.0	8.1
MLM/FLS	6.4	9.8	4.8	7.0

Amount of usage ranged from 'continuously' to 'never use it.' Usage of the MIS is summarized as follows:

Table 13. Use of the MIS

LEVEL/RATING	WIMS	BHAN	MMOIS	TOTAL
TLM (CONSTANTLY)	1	11	5	17
TLM (RARELY)	2	0	2	4
TLM (NOT USED)	1	0	0	1
-----				
TOTAL	4	11	7	22
MLM/FLS (CONSTANTLY)	16	20	21	57
MLM/FLS (RARELY)	4	0	1	5
MLM/FLS (NOT USED)	3	1	0	4
-----				
TOTAL	23	21	22	66

All three MIS are being utilized. 17 TLM (77.3%) and 57 MLM/FLS (86.4%) constantly use the MIS (i.e. on a daily basis); 4 TLM (18.2%) and 5 MLM/FLS (7.6%) rarely use it (weekly/monthly basis); only 1 TLM (4.5%) and 4 MLM/FLS (6.1%) never use the MIS.

The average number of interactions on WIMS was well above the mean for TLM, but well below the mean for MLM/FLS. This relates to the access data in Table 11: less access usually means less numbers of interactions. WIMS appears to be used less constantly than the others, while BHAN is the most heavily used MIS on both levels.

What sort of things do you use the MIS for? The results of this question provided a list of tasks for which the MIS was used.

Table 14. Functional Usage for the MIS

FUNCTION LEVEL	WIMS	BHAN	MMOIS	NUMBER/PERCENT of TOTAL
Electronic Mail				
TLM	2	11	7	20/90.9%
MLM/FLS	9	22	7	53/80.3%
Word Processing				
TLM	1	6	2	9/40.9%
MLM/FLS	12	12	6	30/45.5%
Status Reports				
TLM	4	0	0	4/18.2%
MLM/FLS	22	7	1	30/45.5%
Calendar				
TLM	0	3	0	3/13.6%
MLM/FLS	1	4	3	8/12.1%
Suspense D-Base				
TLM	0	0	1	1/ 4.5%
MLM/FLS	7	0	0	7/10.6%
Spreadsheet				
TLM	0	0	1	1/ 4.5%
MLM/FLS	1	1	3	5/ 7.6%
Graphics				
TLM	0	0	1	1/ 4.5%
MLM/FLS	3	0	2	5/ 7.6%
Daily Reminder				
TLM	0	1	0	1/ 4.5%
MLM/FLS	0	0	1	1/ 1.5%
Requisitions				
TLM	0	0	0	N/A
MLM/FLS	3	0	0	3/ 4.5%
Phone Listings				
TLM	0	0	0	N/A
MLM/FLS	1	0	0	1/ 1.5%

The researcher was very careful to keep this question open-ended, i.e. "prompting" of participants as to their usage of the MIS was kept to a minimum. Note: participants listed more than one function. The most common entries among TLM were electronic mail and word processing. Decision making data (such as status reports and spreadsheets) were being utilized more on the MLM/FLS level than by TLM. Note that nearly all WIMS users on both levels used status reports.

Data in this table relates to the third selection criterion; with the exception of WIMS, MIS usage for reporting functions was minimal. Message traffic was the predominant usage. In many ways, all three MIS were nothing more than message-passers.

Do you feel you have the knowledge of how the MIS operates which allows you to accomplish your job? This question was incorporated into the research primarily at the request of the sponsoring agencies. They were eager to determine the level of user's knowledge for the identification of weak areas and design of future training. Answers generally fell into three categories: high degree of knowledge, sufficient degree, and insufficient or nonexistent degree of knowledge:

Table 15. Level of Knowledge

LEVEL/RATING	WIMS	BHAN	MMOIS	TOTAL
TLM (HIGH)	0	10	6	16
TLM (SUFFICIENT)	3	1	1	5
TLM (INSUFF/NON)	1	0	0	1
-----				
TOTAL	4	11	7	22
MLM/FLS (HIGH)	7	14	14	35
MLM/FLS (SUFFICIENT)	14	7	6	27
MLM/FLS (INSUFF/NON)	2	0	2	4
-----				
TOTAL	23	21	22	66

TLM had a high degree of job knowledge among 16 participants (72.7%). 5 (22.8%) felt they had sufficient knowledge, with only 1 (4.5%) describing it as insufficient or nonexistent. The results were different on the MLM/FLS level. 35 participants (53.0%), felt they had high knowledge, 27 (40.9%) termed it sufficient, while 4 (6.1%) felt their knowledge was insufficient or nonexistent. The overall level of knowledge of WIMS appears to be the lowest of the three MIS; this is particularly evident among TLM. BHAN and MMOIS users indicated high levels of knowledge.

However, even those that commented favorably did say that training was only sufficient for what they needed to know immediately; they didn't feel familiar enough with the MIS to 'play with it' and expand their utilization.

Have you been a user of other similar, computerized management information systems? If so, was it in this organization? If so, then compared to the best such other system, how would you rate this system? These questions, as well as the two that follow regarding usefulness and time-saving qualities of the MIS, were designed to provide a general impression of the user's feelings and perceptions towards the MIS. They seemed to help 'break the ice' and relax the participant while providing information of value.

Table 16. Use of Similar MIS (TLM)

LEVEL/RESPONSE	WIMS	BHAN	MMOIS	TOTAL
TLM (YES)	3	6	4	13
TLM (NO)	1	5	3	9
-----				
TOTAL	4	11	7	22

Table 17. Use of Similar MIS (MLM/FLS)

LEVEL/RESPONSE	WIMS	BHAN	MMOIS	TOTAL
MLM/FLS (YES)	8	8	6	22
MLM/FLS (NO)	15	13	16	44
-----				
TOTAL	23	21	22	66

13 of the TLM participants (59.1%) used a similar system. Of those 13, 6 (46.2%) of the systems were in the same organization.



In contrast, only 22 of the MLM/FLS (33.3%) used a similar system. Of those 22 individuals responding positively, 12 (54.5%) of the systems were in the same organization while 10 (45.5%) were different.

The experience level on a similar MIS is highest among WIMS TLM. All users on the MLM/FLS level lacked experience with similar systems by nearly a two to one margin.

Table 18. Ratings of Similar MIS (TLM)  
Per Organization (n = 13)

	much worse [	1	2	3	4	5	] much better
WIMS (n=3)		0	1	1	1	0	
Mean = 3.0							
BHAN (n=6)		0	0	4	1	1	
Mean = 3.5							
MMOIS (n=4)		0	2	2	0	0	
Mean = 2.5							
Overall Mean = 3.1							

Table 19. Ratings of Similar MIS (MLM/FLS)  
Per Organization (n = 22)

	much worse [	1	2	3	4	5	] much better
WIMS (n=8)		0	3	3	2	0	
Mean = 2.8							
BHAN (n=8)		0	0	6	1	1	
Mean = 3.4							
MMOIS (n=6)		0	0	3	3	0	
Mean = 3.5							
Overall Mean = 3.2							

Overall, users of previous systems rated the current MIS as about the same as previous systems, BHAN users rated BHAN slightly better than previous systems, and WIMS/MMOIS users rated their MIS about the same.

How would you finish the following statements:

[A] I feel the MIS:

Table 20. Usefulness Rating (TLM)  
Per Organization

	[ 1      2      3      4      5 ]					is very useful
is of very little real use						
WIMS (n=4) Mean = 2.5	1	1	1	1	0	
BHAN (n=11) Mean = 4.2	0	1	2	2	6	
MMOIS (n=7) Mean = 3.5	0	2	1	3	1	
Overall Mean = 3.6						

Table 21. Usefulness Rating (MLM/FLS)  
Per Organization

	[ 1      2      3      4      5 ]					is very useful
is of very little real use						
WIMS (n=23) Mean = 3.6	2	1	8	5	7	
BHAN (n=21) Mean = 4.1	0	1	4	8	8	
MMOIS (n=22) Mean = 3.4	0	5	7	8	4	
Overall Mean = 3.7						

[B] I feel the MIS

Table 22. Time-Saving Rating (TLM)  
Per Organization

	costs me additional time					saves me time				
	[	1	2	3	4	5	]			
WIMS (n=4)		1	0	3	0	0				
Mean = 2.5										
BHAN (n=11)		0	0	1	6	4				
Mean = 4.3										
MMOIS (n=7)		0	2	1	2	2				
Mean = 3.6										
Overall Mean = 3.7										

Table 23. Time Saving Rating (MLM/FLS)  
Per Organization

	costs me additional time					saves me time				
	[	1	2	3	4	5	]			
WIMS (n=23)		1	1	5	6	10				
Mean = 4.0										
BHAN (n=21)		0	0	7	7	7				
Mean = 4.0										
MMOIS (n=22)		0	3	8	7	4				
Mean = 3.5										
Overall Mean = 3.8										

This data shows fairly high user opinions of all three MIS in terms of usefulness and time-savings, the only exception being WIMS TLM who rated their MIS low for both criteria. Overall, 59.1% of TLM rated the MIS '4' or '5'

on usefulness and 63.7% of TLM rated the MIS '4' or '5' on time-savings. Overall, 57.6% of MLM/FLS rated the MIS '4' or '5' on usefulness and 63.5% of MLM/FLS rated the MIS '4' or '5' on time-savings.

Do you receive regular routine outputs from the MIS, as required by your job? If so, how often? Would it be possible to get copies of these? This question is a follow-up to the earlier query regarding MIS usage. The purpose of this question is to determine the extent to which management uses screen displays from the MIS as a regular source of data in the context of their job. Some respondents enthusiastically accept the 'paperless office' while others cling to hard copy reports received via the morning mail. (Hard copy reports were not counted as routine outputs).

Table 24. Receipt of Regular Reports

LEVEL/RESPONSE	WIMS	BHAN	MMOIS	TOTAL
TLM (YES)	3	8	4	15
TLM (NO)	1	3	3	7
-----				
TOTAL	4	11	7	22
MLM/FLS (YES)	19	14	14	47
MLM/FLS (NO)	4	7	8	19
-----				
TOTAL	23	21	22	66

The majority of users appeared to use MIS for regular reporting functions, although not in overwhelming numbers. Among the TLM group, 15 (68.2%) regularly receive routine reports, such as those found in appendix G. Among the MLM/FLS group, 47 participants (71.2%) regularly receive routine reports such as the those found in appendix H.

Users of the WIMS appear to utilize its regular reporting features more than the other two systems. This relates to the functional usage data in Table 14, which showed high usage of status reports among WIMS users. Reception of regular reports varied among users; typical frequency was either a daily or weekly basis. However, paperless transmission of data is still not a complete reality for regular operations.

Do you voluntarily request and receive any optional, ad hoc, reports or special features of the MIS for your job? If so, how often? Would it be possible to get copies of these? This series of question is similar to the previous group of questions but focused on the MIS as an irregular source of data. Many respondents used ad hoc reports to answer "short suspenses" on an "as needed" basis.

Table 25. Receipt of Ad Hoc Reports

LEVEL/RESPONSE	WIMS	BHAN	MMOIS	TOTAL
TLM (YES)	3	9	4	16
TLM (NO)	1	2	3	6
-----				
TOTAL	4	11	7	22
MLM/FLS (YES)	19	20	20	59
MLM/FLS (NO)	4	1	2	7
-----				
TOTAL	23	21	22	66

Ad hoc reporting seems more popular with all three MIS, especially among the MLM/FLS group. Among the TLM group, 16 participants (72.7%) received ad hoc reports, such as appendix I. Among the MLM/FLS group, 59 participants (89.4%) used the MIS for ad hoc reporting. Frequency of reception of ad hoc reports varied almost to the individual participant, and ranged from several times per month to several times per hour. There is very little differentiation among all three MIS.

The nature of the decision might explain this. An ad hoc query typically supports a response of the organization's management to a highly political query, (frequently a complaint). In order to provide his/her commander with an immediate answer, the manager needs instant status information and relies on the MIS. This time pressure is not felt with day-to-day operations.

As previously mentioned, these results seem to show that reporting is a large function of MIS. Yet, the data in table 14 contradicts this. The only explanation this researcher can give is that users, when directly asked about reporting functions, reply in the affirmative. However, when asked general questions regarding MIS usage, (and with no "prompting" by the interviewer), users fail to think of reports as a critical function of their MIS.

#### Conclusions to Common Questions

This section provided data on responses to common questions asked both levels of participants. BHAN and MMOIS showed nearly identical data. Both systems are popular and widely used, predominately for message traffic. Users of both systems give high ratings for usefulness and time-savings ability. MMOIS utilizes spreadsheets and graphics to a higher degree.

This research indicates BHAN is being utilized primarily as an electronic mail/word processing system. Many of its "decision-making" functions are not being used to the fullest degree. The impressions this researcher drew from personal observations were that BHAN users truly liked the system and saw its advantage as a communications tool. Many participants said they wanted for terminals for all their subordinates, as well as data-communications links to other systems (such as WIMS). Perhaps the most common criticism was lack of training. Users seem to be

aware of the potential of MIS but do not know how to tap it. Until that happens, BHAN will remain simply an excellent electronic mail system.

MMOIS users have expanded usage of different functions but are hampered slightly by lack of knowledge and experience. MMOIS is facing an unusual situation. AFLC/ Material Management is a highly volatile organization that has gone through several recent restructurings. It is the observation of this researcher that the organization lacks a corporate identity; some individuals changed job titles so frequently, they had trouble telling me their present one. Until the organization stabilizes, the impact of MIS implementation will be hard to measure.

In the opinion of this researcher, both organizations would improve the overall efficiency of their MIS if more and better training were available.

Of the three systems, WIMS proved the most unique. WIMS has high access (table 11), high average number of interactions (table 12), and high utilization of reporting functions (tables 14, 24, & 25) among top level managers. However, overall usage (table 13) was down and usefulness & time-savings ratings (tables 20 & 22) were low. Among MLM/FLS, access is limited (table 11), yet overall usage was up (table 13) and usefulness & time-savings were high (tables 21 & 23). It appears that the more user access, the less overall usage with lower user opinions.



In addition, users indicated high experience on similar systems (table 16), yet rated their knowledge of WIMS low (table 15). Despite access and training problems, WIMS users on both levels do utilize many decision-making functions. Therefore, WIMS users are highly experienced computer users who do not know their own MIS. Additional user training seems to be needed in order to allow a system that is both available and popular to reach its full potential.

### Response to Research Questions

The next series of questions were designed specifically to meet the research objectives proposed in chapter one. These questions were asked of both levels of management with a slight change in wording between the two. Side-by-side comparison between TLM and MLM/FLS is possible.

The term span of control means the number of subordinates who report directly to any one supervisor. In those organizational units to which the MIS has been applied, has the average supervisory span of control changed in any way? Please identify the affected units and tell me if the average span of control has increased, decreased, or remained unchanged. The purpose of this question is to answer research question one:

In measuring the effect of MIS on military organization structure, has there been a perceived increase or decrease in supervisory span of control, according to the perceptions of military or Department of Defense (DOD) civilian supervisors, following implementation. If so, by how many individuals?

This question examines the horizontal dimensions of the organization and was designed to detect span of control changes in units throughout the organization. The question (worded in this form) was asked only of top level managers due to their wider area of responsibility. It asks them to consider the average span of control of units throughout their domain and comment on perceived changes; results can be compared with lower levels responses.

Table 26. Change in Average Span of Control (TLM)

RESPONSE/TYPE	WIMS	BHAN	MMOIS	TOTAL
YES/INCREASE	2	8	6	16
YES/DECREASE	0	0	0	0
NO	2	3	1	6
-----				
TOTAL	4	11	7	22

Of the 22 TLM participants, 16 (72.7%) indicated there had been a change (an increase) in the average span of control of units within their area of responsibility. In terms of ratio, the change was most noticeable among MMOIS users, followed closely by BHAN users. WIMS users were evenly divided over any perceptions of change to span.

If there was a change, how much of the change do you attribute to the implementation of the MIS? The ratings of the 16 positive participants are as follows:

Table 27. Ratings of MIS Impact (TLM)  
Span of Control - By Organization

	change was not caused by MIS					change was all caused by MIS				
	[	1	2	3	4	5	]			
WIMS (n=2) Mean = 5		0	0	0	0	2				
BHAN (n=8) Mean = 3		1	1	4	1	1				
MMOIS (n=6) Mean = 1.5		3	2	1	0	0				
Overall Mean = 2.7										

Overall, participants who indicated a change in average span of control remained non-committal regarding MIS impact. More MMOIS users indicated an increase in average span of control than users of the other MIS, yet they rated MIS impact as negligible. WIMS users felt the increase was completely due to WIMS and BHAN users were evenly divided on the question.

A formal change to span of control is defined as an actual change to the number of subordinates who report directly to any one supervisor. An informal change is a perception on the part of a supervisor that his/her control has changed. Of the 16 that answered positively to a change, 8 (50%) indicated a formal change in span of control while 8 (50%) felt the change was only informal.

Have you perceived any changes in your span of control since the implementation of the MIS? By this I mean has the number of people who report directly to you increased, decreased, or remained unchanged? This question, asked of top level managers, is the follow-up to the previous one. It asks participants to consider their personal span of control, i.e. the number of individuals who directly report to them. Their responses are:

Table 28. Change in Personal Span of Control (TLM)

RESPONSE/TYPE	WIMS	BHAN	MMOIS	TOTAL
YES/INCREASE	0	4	1	5
YES/DECREASE	0	1	0	1
NO	4	6	6	16
-----				
TOTAL	4	11	7	22

16 of 22 participants (72.7%) indicated no change in their personal span of control. In terms of ratio, the absence of change was most noticeable among WIMS users, followed by MMOIS. BHAN users were evenly divided over span of control changes.

Note: Due to an oversight by the researcher, TLM was not asked to attribute any perceived changes to personal span of control to MIS implementation. This is unfortunate since it would have allowed a side-by-side comparison of responses.

Summary. The data found in tables 26 - 28 show that a majority of TLM participants (72.7%) feel there have been span of control increases among units within their area of responsibility. However, the identical percentage feels their personal span hasn't changed, the only exception being BHAN users. Most participants do not feel the changes were caused by the MIS, with the exception of two WIMS users who attribute changes entirely to WIMS.

The fact that few TLM perceived change in their personal span of control may be due the bureaucratic

nature of the environment. In military organizations, formal reporting relationships remain stable for long periods of time, changing only as a result of infrequent organizational restructuring. However, budget cuts and a 'do more with less' atmosphere has led to the following comments:

- 'Hasn't had a direct impact but lets the survivors keep up with the job.'
- 'Hasn't changed things but has the potential to make span wider.'

Some BHAN users did indicate increases in both average and personal span of control, while MMOIS users saw a change only in average span. Both organizations saw little relation between changes and MIS implementation. BHAN and MMOIS are little more than communications tools whose existence does not appear to affect organizational structure.

WIMS users did indicate that average span of control changes were caused by the MIS. This may be due, in part, to the level of sophistication of systems usage. Earlier research data showed that WIMS goes beyond message passing and provides significant decision making information. WIMS users see more potential in their MIS.

Have you perceived any changes in your span of control since the implementation of the MIS? By this I mean has the number of people who report directly to you increased, decreased, or remained unchanged? This question asked mid level managers and first line supervisors to consider their personal span of control and comment on any perceived changes.

Table 29. Changes in Personal Span of Control (MLM/FLS)

RESPONSE/TYPE	WIMS	BHAN	MMOIS	TOTAL
YES/INCREASE	11	10	11	32
YES/DECREASE	6	0	5	11
NO	6	11	6	23
-----				
TOTAL	23	21	22	66

Of the 66 MLM/FLS participants, 43 (65.2%) indicated there had been a change in personal span of control. This figure can be compared to TLM's perception that 72.7% of their units had a change in span of control (table 26). Of the 43 that answered positively to a change, 32 (74.4%) indicated there had been an increase in in span of control.

Changes in personal span of control were perceived by MMOIS users (as TLM did indicate) and WIMS users (as TLM did not indicate). But, the majority of BHAN users reported no change, despite TLM opinions to the contrary.

If there was a change, how much of the change do you attribute to the implementation of the MIS? The ratings of the 43 positive participants are as follows: (n=43)

Table 30. Ratings of MIS Impact (MLM/FLS)  
Span of Control - By Organization

change was not caused by MIS						change was all caused by MIS	
	[	1	2	3	4	5	]
WIMS (n=17)		10	0	3	0	4	
Mean = 2.3							
BHAN (n=10)		6	0	1	2	1	
Mean = 2.2							
MMOIS (n=16)		11	1	2	2	0	
Mean = 1.7							
Overall Mean = 2.1							

Overall, participants who indicated a change in personal span of control showed a tendency to negate MIS impact. The large number of MMOIS users reporting changes to their personal span of control felt such changes were not due to MMOIS. Both WIMS and BHAN users gave results that show an unusual pattern, but indicate MIS impact is not major.

Summary. The data in tables 29 -30 shows that a majority of MLM/FLS participants (65.2%) feel their personal span of control has changed. There is evidence of both increases and decreases in span of control. Earlier data from TLM indicated a large number of users



reported changes in average span of control among units within their area of responsibility, with minimal MIS impact (tables 26 & 27). This was supported by the large number of MLM/FLS who did report changes in personal span of control and minimal MIS impact. Note that MLM/FLS did report a higher number of span of control decreases than anticipated by TLM. These results show the perceptions of MLM/FLS and the perceptions of TLM regarding MLM/FLS are similar.

Users of MMOIS seem to have a clear perception of the impact of MMOIS on their organizational structures. TLM's perception of MIS impact seemed to agree with MLM/FLS's perception.

Results were different in the other two organizations. Among WIMS users, comparisons show that some TLM indicated change in average span of control with high MIS impact. MLM/FLS's results showed a majority of users perceived changes in average span of control (both increases and decreases) with minimal MIS impact. Among BHAN users, a majority of TLM indicated change in average span of control, yet much less MLM/FLS reported, with minimal MIS impact.

This data shows an existence of distorted perceptions regarding organizational structure. Some MIS users tend to either underrate or overrate the impact of MIS on their organizations.

The term vertical complexity means the number of hierarchical levels between a supervisor and other members of his/her organizational hierarchy. In those organizational units to which the MIS has been applied, has the vertical complexity changed in any way? Please identify the affected units and tell me if the vertical complexity has increased, decreased, or remained unchanged. The purpose of this question is to answer research question two:

In measuring the effect of MIS on military organization structure, has there been a perceived increase or decrease in vertical complexity within the military organization structure, according to the perceptions of military or Department of Defense (DOD) civilian supervisors, following implementation. If so, by how many individuals?

This question was designed to detect vertical complexity changes in units throughout the organization. This question (worded in this form) was also asked only of top level managers because of their wider area of responsibility. It asks them to consider vertical complexity of units throughout their domain and comment on perceived changes. Results can be compared with responses from lower levels.

Table 31. Change in Average Vertical Complexity (TLM)

<u>RESPONSE/TYPE</u>	<u>WIMS</u>	<u>BHAN</u>	<u>MMOIS</u>	<u>TOTAL</u>
YES/INCREASE	0	0	0	0
YES/DECREASE	1	4	6	11
NO	3	7	1	11
-----				
TOTAL	4	11	7	22

Of the 22 TLM participants, 11 (50.0%) indicated there had been a change in average vertical complexity of units within their area of responsibility. In terms of ratio, the change was most noticeable among MMOIS users while the majority of BHAN and WIMS users reported no change. All of the 11 that answered positively to a change indicated there had been a decrease in vertical complexity.

If there was a change, how much of the change do you attribute to the implementation of the MIS? The ratings of the 11 positive participants are as follows: (n=11)

Table 32. Ratings of MIS Impact (TLM)  
Vertical Complexity - By Organization

	change was not caused by MIS					change was all caused by MIS	
	[	1	2	3	4	5	]
WIMS (n=1) Mean = 5.0		0	0	0	0	1	
BHAN (n=4) Mean = 3.2		0	0	3	1	0	
MMOIS (n=6) Mean = 2.2		2	2	1	1	0	
Overall Mean = 2.8							

Overall, participants who indicated a change in average vertical complexity remained non-committal regarding MIS impact. The largest percentage of users reporting a

decrease was MMOIS users, yet they rated MIS impact as negligible. The sole WIMS user felt the decrease to his/her vertical complexity was all caused by WIMS. BHAN users were generally neutral.

A formal change to vertical complexity is defined as an actual change to the number of management levels in the hierarchy of authority. An informal change is a perception on the part of the manager that the organizational hierarchy has grown or shrunk. Of the 11 that answered positively to a change, 5 (45.5%) indicated there had been a formal change in vertical complexity while 6 (54.5%) felt the change was only informal.

Have you perceived any changes in the vertical complexity of your organization since the implementation of the MIS? By this I mean are there more levels between you and lower levels? This question, asked of top level managers, was the follow-up to the previous one. It asks participants to consider personal vertical complexity, i.e. the number of layers of management between them and the lowest levels. Their responses are as follows:

Table 33. Change in Personal Vertical Complexity (TLM)

RESPONSE/TYPE	WIMS	BHAN	MMOIS	TOTAL
YES/INCREASE	0	0	1	1
YES/DECREASE	0	3	0	3
NO	4	8	6	18
-----				
TOTAL	4	11	7	22

18 of the 22 participants (81.8%) felt there had been no change in their personal vertical complexity. Only BHAN users identified a decrease. Note: Due to an oversight by the researcher, TLM did not attribute perceived changes to personal vertical complexity to MIS implementation.

Summary. Overall perceptions of changes in vertical complexity were not strongly evident among TLM, although both BHAN and MMOIS users identified decreases in the vertical complexity of subordinate units (table 31). A large percentage of MMOIS users saw decreases but did not attribute them to the MIS. Some BHAN users reported decrease in personal span of control, but few WIMS users perceived changes in either personal or average vertical complexity. The few users that did identify changes were divided as to MIS impact.

This may be due to the fact that changes to vertical complexity are more difficult to perceive in a military environment. The bureaucratic structure tends to stabilize formal hierarchy so that, with few exceptions, the military "chain-of-command" is closely adhered to.

TLM users of MMOIS and BHAN did report decreases to average vertical complexity of units within their area of responsibility. Comments included:

- "Does tend to break down barriers of chain of command."
- "In years past, couldn't get information from lower levels to the top. Now, get unfiltered information. This is both good and bad."

Have you perceived any changes in the vertical complexity of your organization since the implementation of the MIS? By this I mean are there more levels between you and lower levels? This question, asked only of mid level managers and first line supervisors, was the follow-up to the previous one. It asks participants to consider the vertical complexity of the organization which directly affects them, and comment on any perceived changes.

Table 34. Change in Personal Vertical Complexity (MLM/FLS)

RESPONSE/TYPE	WIMS	BHAN	MMOIS	TOTAL
YES/INCREASE	3	0	2	5
YES/DECREASE	3	7	5	15
NO	17	14	15	46
-----	-----	-----	-----	-----
TOTAL	23	21	22	66

Of the 66 participants, 20 (30.3%) indicated there had been a change in personal vertical complexity. This differs from the data that indicated 50% of TLM perceived a change in vertical complexity (table 31). Of the 20 that answered positively to a change, 15 (75.0%) indicated there had been a decrease in vertical complexity.

Changes to personal vertical complexity were not perceived by a majority of users of all three MIS. This supports TLM's indications for WIMS & BHAN but contradicts the perceptions of MMOIS TLM, most of whom felt the average vertical complexity of their units had decreased.

If there was a change, how much of the change  
do you attribute to the implementation of the MIS? The  
 ratings of the 20 positive participants are as follows:

Table 35. Ratings of MIS Impact (MLM/FLS)  
 Vertical Complexity - By Organization

	change was not caused by MIS					change was all caused by MIS	
	[	1	2	3	4	5	]
WIMS (n=6) Mean = 2.2		3	1	1	0	1	
BHAN (n=7) Mean = 3.7		1	1	0	2	3	
MMOIS (n=7) Mean = 2.7		3	0	2	0	2	
Overall Mean = 3.4.							

Overall, participants who indicated a change in personal vertical complexity felt the MIS had some impact on the change. BHAN users felt the change to their vertical complexity was largely caused by BHAN. WIMS users disagreed, indicating minimal MIS impact. MMOIS users remained non-committal on the question.

Summary. The data found in tables 34 & 35 shows that a majority of MLM/FLS participants (69.7%) perceived no change in vertical complexity, although there is evidence of some increase/decreases. Earlier data from TLM showed indicated that 50% of TLM perceived no change in average vertical complexity among units within their area of

responsibility (tables 31 & 32). These results show that the perceptions of MLM/FLS and the perceptions of TLM regarding MLM/FLS are similar.

This agreement between levels of management is most evident among BHAN users: some TLM indicated decreases (36.4%) in average vertical complexity among units within their area of responsibility with minimal MIS impact (tables 31 & 32). This proved to be the case as some MLM/FLS reported decrease (33.3%) in personal vertical complexity with a divided perception of MIS impact (tables 34 & 35). Therefore, users of BHAN seem to have a clear perception of the impact of BHAN on their organizational structures.

Results were different in the other two organizations. Among WIMS users, comparisons show that one TLM indicated changes in average vertical complexity with high MIS impact. A few MLM/FLS did report change in average vertical complexity (both increases and decreases) but deemphasized the impact of WIMS. Users of MMOIS seem to have a disagreement over perceived changes in vertical complexity. Most TLM indicated a decrease in average vertical complexity, yet most MLM/FLS reported no change. Those that indicated a change were split widely in their perception of the impact of MIS.



Have any new departments or sections been created as a result of the MIS? Have any old departments or sections been eliminated as a result of the MIS? What changes in the locations of specific functions have been made as a result of the MIS? For example, has there been any shifting around of activities or people? These questions were key in determining the perceived structural effects of MIS implementation. The respondent is asked to recall any development of new/ deletion of old organizational units related to the MIS. This question simply compares the participant's before and after perceptions of organizational structure.

Table 36. Change in Organization Structure (TLM)

RESPONSE/TYPE	WIMS	BHAN	MMOIS	TOTAL
YES/INCREASE	3	3	1	7
YES/DECREASE	1	1	0	2
NO	0	7	6	13
-----				
TOTAL	4	11	7	22

Table 37. Change in Organization Structure (MLM/FLS)

RESPONSE/TYPE	WIMS	BHAN	MMOIS	TOTAL
YES/INCREASE	10	8	9	27
YES/DECREASE	1	3	5	9
NO	12	10	8	30
-----				
TOTAL	23	21	22	66

Of the 22 TLM participants, 9 (40.9%) perceived change to the organizational structure; of the 66 MLM/FLS participants, 36 (54.5%) perceived change to the organization structure. Each organization created a new computer department to support the MIS; the increases indicated by users reflect these new departments. The decreases (among WIMS and BHAN users) were specifically due to elimination of two word processing centers. All three MIS seemed to have affected perceptions of organizational structure changes to a greater degree on the MLM/FLS levels

The data does show an interesting contrast. 100% of WIMS TLM users felt there had been structural change, yet the majority of BHAN and MMOIS users saw no change. This contrasts with the MLM/FLS group, where the pattern seems to show a fairly even distribution of perceived changes due to the MIS. Only MMOIS users shows more reports of change than not.

### Conclusions to Research Questions

This section provided data on responses to questions specifically designed to meet the research objectives proposed in Chapter One. Findings are summarized as follows:

- The personal span of control of top level management has not shown any significant change.
- The personal span of control of mid level management/first line supervisors has shown significant change. This change is predominantly an increase in span.
- The perceptions of top level management regarding average span of control of their subordinates were distorted in two of the three organizations. The impact of WIMS and BHAN was highly overrated by top level management.
- The personal vertical complexity of top level management has not shown any significant change.
- The personal vertical complexity of mid level management/first line supervisors has not shown any significant change.
- The perceptions of top level management regarding average vertical complexity of their subordinates distorted in two of the three organizations. Top level management users of MMOIS overestimated changes to their sub-units. The impact of WIMS was highly overrated.
- The changes that occurred were generally perceived not to be the direct result of MIS implementation.

These results will be examined further in Chapter Five.

A summary of comparisons of MIS impact between all three organizations yielded unusual results. BHAN appeared to affect both top level management and mid level management/first line supervisors. WIMS and MMOIS, on the other hand, had negligible effect on top level

management but significant effect on mid level management/  
first line supervisors.

Table 38. Differences Between Organizations

LEVEL/TYPE	WIMS	BHAN	MMOIS
TLM/SPAN	0.0% increase	36.4% increase	14.3% increase
OF CONTROL	0.0% decrease	9.1% decrease	0.0% decrease
TLM/VTCL	0.0% increase	0.0% increase	14.3% increase
COMPLEXITY	0.0% decrease	27.3% decrease	0.0% decrease
MLM/SPAN	47.8% increase	47.6% increase	50.0% increase
OF CONTROL	26.1% decrease	0.0% decrease	22.7% decrease
MLM/VTCL	13.1% increase	0.0% increase	9.1% increase
COMPLEXITY	13.1% decrease	33.3% decrease	22.7% decrease

It is the observation of this researcher that the broad impact of BHAN is partially due to the level of user sophistication. BHAN, as already noted, is not being utilized to its full potential. Its role as a simple communications device means it easily permeates the daily activities of all management levels. But the mere presence of large numbers of reports-of-change does not mean large changes are taking place. This researcher feels the effect of BHAN on the 2750th Air Base Wing, although extensive in number, is not of major concern. BHAN users could do their job just as well without BHAN, just slower.

The effect of WIMS on mid level managers and first line supervisors has to do with organizational culture. It is the observation of this researcher that WIMS users expect more from their MIS. Perhaps the nature of their

business (Civil Engineering) has something to do with it but, WIMS users seem to have embraced information systems and are hungry for more. They feel they could not do their job without WIMS; too much of their daily activities are stored in that mainframe. As a result, more MIS impact is recognized.

MMOIS users are in the middle of the spectrum. Although basically a communications tool, MMOIS does show some evidence of decision-making capability. MMOIS users are experimenting with applications and demonstrating some computer literacy. But, it is the observation of this researcher that the constant upheaval of the organization has hurt the overall efficiency and effectiveness of the MIS. An information system must fit the organization's mission and goals, not the other way around.

#### Individual Questions

The last series of questions are not directly applicable to the research objectives proposed in chapter one. They were asked for the benefit of the sponsoring agencies in order to determine MIS impact on specific managerial characteristics. Since the information gained from these questions does not directly apply to this thesis effort, analysis of responses is found in Appendix E.

## V. Conclusions and Recommendations

### Introduction

This chapter will discuss the results of the case study interviews and apply these findings to the research questions. Conclusions will be drawn based on the findings and recommendations made for future research and Air Force MIS implementations.

This research was designed to gain a basic understanding of MIS impact on organizational structure following systems implementation. The case study method involving three organizations was exploratory in nature and precluded rigorous examination of any one specific area.

### Conclusions (Research Question # One)

Research Question # 1 asks : In measuring the effect of MIS on military organization structures, has there been a perceived increase or decrease in supervisory span of control, according to the perceptions of military or Department of Defense (DOD) civilian supervisors, following implementation? If so, by how many individuals?

This research shows that, according to the perceptions of military and DOD civilian supervisors, there have been both increases and decreases in supervisory span of control. Since only a small minority of participants perceived changes that could be directly attributed to MIS implementation,

the evidence is not strong enough to suggest any causal relationships. Therefore, this research concludes that the implementation of a MIS does not cause changes in span of control.

This finding is in agreement with the conclusions of the Bjorn-Anderson study (9, 93) that structural change may or may not accompany systems implementation.

The changes that did occur consisted of increases and decreases. This thesis found that top management showed practically no change in personal span of control; what change did occur was an increase (BHAN). This is a contradiction of Blau's findings (12) that the span of control of chief executive officers and division heads decreases following systems implementation (table 7). A likely explanation for this is found in the bureaucratic nature of the military environment. Formal reporting relationships among senior military managers tend to remain stable for long periods of time. Any changes that occur as a result of organizational restructuring are usually not reflected in upper managerial levels.

This thesis also found that mid level management/first line supervisors had evidence of both increases and decreases among all three organizations. This supports Blau's findings (12) that show increases for section heads and decreases for first line supervisors. Within a

bureaucracy, any type of change in organizational structure is apt to occur more readily in lower levels.

Changes in span of control could be in the form of formal organizational restructuring or mere informal expansion of supervisory influence. Changes were perceived in both forms among top level management and mid level/first line supervisors. However, these changes in span of control were not directly attributable to the implementation of the MIS.

#### Conclusions (Research Question # Two)

Research Question # 2 asks: In measuring the effect of MIS on military organization structures, has there been a perceived increase or decrease in vertical complexity within the military organization structure, according to the perceptions of military or Department of Defense (DOD) civilian supervisors, following implementation? If so, by how many individuals?

This research shows that, according to the perceptions of military and DOD civilian supervisors, there have been some decreases in hierarchical vertical complexity. Since only a small minority of participants perceived changes that could be directly attributed to MIS implementation, the evidence is not strong enough to suggest any causal relationships. Therefore, this research concludes that the implementation of a MIS does not cause changes in vertical complexity.



This finding is in agreement with the conclusions of the Bjorn-Anderson study (9, 93) that structural change may or may not accompany systems implementation.

The changes that did occur were basically decreases. This thesis found that top level management showed practically no change in personal vertical complexity; what change did occur was a decrease (BHAN). Again, the stable, bureaucratic nature of the military environment is an explanation for this. Mid level management/first line supervisors reported some evidence of both increases and decreases among all three organizations. Blau's findings (12) simply reported an increase in hierarchical levels and does not differentiate among managerial levels.

The change that was indicated by this research was not directly attributable to the implementation of an MIS.

#### Recommendations for Future Research

Further research in this area is strongly advised. As indicated in Chapter One, private sector research has significant difficulty in its applicability to public sector situations. This is particularly compounded when the military environment, with its unique demands, is involved. Recommendations for future research include:

- a. Expand this study with broader organization selection criteria to include both EDP systems for basic transaction processing and data/model based MIS. A limitation of this research is that organizations failed to fully meet selection criteria.

- b. Duplicate this study and examine two military organizations that are virtually identical in terms of mission, information requirements, and management information systems. This will augment the data on differences of perceptions among organizational systems users.
- c. Expand this study by incorporating Robey's model for managing information systems impact (94) to determine why and how systems are implemented. This will help predict future systems impact on military organizations.
- d. Duplicate this study in a public sector, non-military environment to determine if the impact of MIS implementation is the same in both types of bureaucracies, or if the military environment is unique.

#### Summary

This thesis attempted to determine the impact of MIS implementation through the eyes of the military manager/supervisor. Two characteristics, supervisory span of control and hierarchical vertical complexity, served as a guide to determine organizational changes. This study was a partial-replication of an earlier research effort by Bjorn-Anderson and others. It only attempted to capture user's perceptions. The results of this study seem to confirm Bjorn-Anderson's conclusions that management information systems do not cause changes in organization structures and such changes may or may not accompany systems implementation.

## Appendix A: Interview Guide

The following interview guides were used by the researcher in the methodology portion of the thesis. There are three separate guides, corresponding to the different participants:

- a) systems manager (appendix B)
- b) top-level manager (appendix C)
- c) mid-level manager/first line supervisors (appendix D)

Interview guides will help insure identical questions are asked of all individuals within each organization.

It is extremely critical that the greatest possible effort be made to follow a uniform procedure when conducting a study of organizational change. It is equally critical to be open to new avenues of exploration through which an individual question may lead. Finally, obtaining documentary evidence to support specific answers is important. Following these procedures will minimize bias.

Appendix B: MIS Implementation  
Interview Guide -- Systems Managers

I. Introduction and thanks to participants

Date ----- Time -----

Organization -----

Department -----

II. Background Information on Participant

A. What is your present job title? How long have you had this position?

B. Give a short job description.

III. Background Information on Organization's MIS

A. What is the name of the management information system?

B. When was the MIS first introduced into your organization?

C. What departments in your organization are affected by the MIS?

D. Was the MIS implemented in stages? If so, what functions were put on the MIS first?

E. Who has access to the MIS? Is a list of specific users available for potential interviewing?

F. What is the primary function of the MIS?

G. What functions are now computerized or soon will be?

H. What type of information does the MIS provide?

I. What types of reports does the MIS provide users?  
Please include both regular and ad-hoc reports?

J. What system did the MIS replace?

Appendix C: MIS Implementation  
Interview Guide -- Top-Level Management

I. Introduction and thanks to participant

Date \_\_\_\_\_ Time \_\_\_\_\_

Organization \_\_\_\_\_

Department \_\_\_\_\_

II. Background Information on Participant

A. What is your present job title?

B. Please give me a short job description.

C. What is your length of time in this job?

D. What is your length of time in the organization?

### III. The Management Information System

For purposes of this research, I am calling the

-----  
a management information system. That is, it is a  
method of providing information to support the  
operations and management of your organization. Any  
future reference to 'the MIS' is referring to the  
-----

A. Please describe your access to the MIS? For  
example, is it very restrictive or unlimited?

B. How often do you use the MIS?

C. What sort of things do you use the MIS for?



D. Do you feel you have the knowledge of how the MIS operates which allows you to accomplish your job?

E. 1) Have you been a user of other similar, computerized management information systems?

2) If so, was it in this organization?

3) If so, then compared to the best such other system, how would you rate this system?

much worse            [ 1 2 3 4 5 ]            much better

F. How would you finish the following statement:  
I feel the MIS

is of very little            [ 1 2 3 4 5 ]            is very useful  
real use

costs me additional            [ 1 2 3 4 5 ]            saves me time  
time

G. Do you receive regular routine outputs from the MIS, as required by your job? If so, how often? Would it be possible to get copies of these?

H. Do you voluntarily request and receive any optional, ad hoc, reports or special features of the MIS for your job? If so, how often? Would it be possible to get copies of these?

I. I would like to determine your knowledge of the MIS's effect on your subordinates. Please tell me which subordinates use the MIS and how they use to accomplish their job.

#### IV. Organization Structure

A. Have any new departments or sections been created as a result of the MIS? Please elaborate.

B. Have any old departments or sections been eliminated as a result of the MIS? Please elaborate.

C. What changes in the locations of specific functions have been made as a result of the MIS? For example, has there been any shifting around of activities or people?

D. The term vertical complexity means the number of hierarchical levels between a supervisor and other members of his/her organizational hierarchy. In those organizational units to which the MIS has been applied, has the vertical complexity changed in any way? Please identify the affected units and tell me if the vertical complexity has increased, decreased, or remained unchanged.

E. If there was a change, how much of the change do you attribute to the implementation of the MIS?

change was not  
caused by MIS

[ 1 2 3 4 5 ]

change was all  
caused by MIS

F. The term span of control means the number of subordinates who report directly to any one supervisor. In those organizational units to which the MIS has been applied, has the average supervisory span of control changed in any way? Please identify the affected units and tell me if the average span of control has increased, decreased, or remained unchanged.

G. If there was a change, how much of the change do you attribute to the implementation of the MIS?

change was not  
caused by MIS

[ 1 2 3 4 5 ]

change was all  
caused by MIS

H. Have you perceived any changes in your span of control since the implementation of the MIS? By this I mean has the number of people who report directly to you increased, decreased, or remained unchanged.

I. Have you perceived any changes in the vertical complexity of your organization since the implementation of the MIS? By this I mean are there more levels between you and lower levels?

J. In the organizational units in which the MIS has been applied, have the number of personnel changed as a consequence

1. at the clerical level? How?

2. at the first-line supervisor levels? How?

3. at the middle/top management levels? How?

Appendix D: MIS Implementation Interview  
Guide -- Mid-Level/First-Line Supervisors

I. Introduction and thanks to participant

Date ----- Time -----

Organization -----

Department -----

II. Background Information on Participant

A. What is your present job title?

B. Please give me a short job description.

C. What is your length of time in this job?

D. What is your length of time in the organization?

### III. The Management Information System

For purposes of this research, I am calling the

-----  
a management information system. That is, it is a  
method of providing information to support the  
operations and management of your organization. Any  
future reference to 'the MIS' is referring to the  
-----

A. Please describe your access to the MIS? For  
example, is it very restrictive or unlimited?

B. How often do you use the MIS?

C. What sort of things do you use the MIS for?



D. Do you feel you have sufficient knowledge of how the MIS operates to allow you to accomplish those things you just described? Please elaborate.

E. 1) Have you been a user of other similar, computerized management information systems?

2) If so, was it in this organization?

3) If so, then compared to the best such other system, how would you rate this system?

much worse            [ 1 2 3 4 5 ]            much better

F. How would you finish the following statement:  
I feel the MIS

is of very little            [ 1 2 3 4 5 ]            is very useful  
real use

costs me additional            [ 1 2 3 4 5 ]            saves me time  
time

G. Do you receive regular routine outputs from the MIS, as required by your job? If so, how often? Would it be possible to get copies of these?

H. Do you voluntarily request and receive any optional, ad hoc, reports or special features of the MIS for your job? If so, how often? Would it be possible to get copies of these?

I. Are you comfortable using the MIS to accomplish those things you just described?

#### IV. Organization Structure

A. Have you perceived any overall changes in the organization since the implementation of the MIS? By this I mean has there been any change to the number of staff or the distribution of staff? For example, has there been any shifting around of activities or people?

B. Have you perceived any changes in the vertical complexity of your organization since the implementation of the MIS? By this I mean are there more levels between you and top management?

C. If there was a change, how much of the change do you attribute to the implementation of the MIS?

change was not	[ 1 2 3 4 5 ]	change was all
caused by MIS		caused by MIS

D. Have you perceived any changes in your span of control since the implementation of the MIS? By this I mean has the number of people who report directly to you increased, decreased, or remained unchanged.

E. If there was a change, how much of the change do you attribute to the implementation of the MIS?

change was not	[ 1 2 3 4 5 ]	change was all
caused by MIS		caused by MIS

V. Departmental Impact.

A. Have you perceived any overall changes in the following departmental/interdepartmental aspects of manager-subordinate relationship since implementation of the MIS? How much of the change do you attribute to the MIS?

(DEPARTMENTAL)

1. Subordinates requesting authorization from you.

change		no change
change was not caused by MIS	[ 1 2 3 4 5 ]	change was all caused by MIS

2. Subordinates requesting action from you.

change		no change
change was not caused by MIS	[ 1 2 3 4 5 ]	change was all caused by MIS

3. Your receiving reports on operations.

change		no change
change was not caused by MIS	[ 1 2 3 4 5 ]	change was all caused by MIS

4. Your giving information to subordinates.

change		no change
change was not caused by MIS	[ 1 2 3 4 5 ]	change was all caused by MIS

5. Your requesting something from subordinates.

change		no change
change was not caused by MIS	[ 1 2 3 4 5 ]	change was all caused by MIS

(INTERDEPARTMENTAL)

1. Your requesting authorization from  
colleagues/superiors

change

no change

change was not  
caused by MIS

[ 1 2 3 4 5 ]

change was all  
caused by MIS

2. Your requesting superiors or colleagues for action

change

no change

change was not  
caused by MIS

[ 1 2 3 4 5 ]

change was all  
caused by MIS

3. Your receiving reports on operations

change

no change

change was not  
caused by MIS

[ 1 2 3 4 5 ]

change was all  
caused by MIS

4. Your giving information to superiors or colleagues

change

no change

change was not  
caused by MIS

[ 1 2 3 4 5 ]

change was all  
caused by MIS

5. Superiors and colleagues requesting something  
from you

change

no change

change was not  
caused by MIS

[ 1 2 3 4 5 ]

change was all  
caused by MIS

B. Have you perceived any influence by the implementation of the MIS on your contact or consultations with your supervisor?

C. Have you perceived any influence by the implementation of the MIS on your contact or consultations with your subordinates?

D. Have you perceived any overall changes in the degree of discretion you practice in your organization, regarding influence on specific tasks? How much of the change do you attribute to the MIS?

1. Degree to which you determine how a task is carried out

change

no change

change was not  
caused by MIS

[ 1 2 3 4 5 ]

change was all  
caused by MIS

2. Degree to which you determine when a task is carried out

change

no change

change was not  
caused by MIS

[ 1 2 3 4 5 ]

change was all  
caused by MIS

3. Degree to which you determine whether a task has been carried out

change

no change

change was not  
caused by MIS

[ 1 2 3 4 5 ]

change was all  
caused by MIS

4. Degree to which orders and advice are  
received from superiors

change

no change

change was not [ 1 2 3 4 5 ]  
caused by MIS

change was all  
caused by MIS

5. Degree to which requests and demands are  
received from subordinates

change

no change

change was not [ 1 2 3 4 5 ]  
caused by MIS

change was all  
caused by MIS

6. Degree to which you are controlled in handling  
tasks

change

no change

change was not [ 1 2 3 4 5 ]  
caused by MIS

change was all  
caused by MIS

7. Degree to which you are dependent on the work of  
others

change

no change

change was not [ 1 2 3 4 5 ]  
caused by MIS

change was all  
caused by MIS

8. Degree to which there are rules, procedures,  
and methods which are to be followed

change

no change

change was not [ 1 2 3 4 5 ]  
caused by MIS

change was all  
caused by MIS

## Appendix E: Responses to Individual Questions

### Responses to Individual Questions - (Top Level Management)

The following questions were asked only of top level management. Side-by-side comparison with mid level management/first line supervisors is not possible.

I would like to determine your knowledge of the MIS's effect on your subordinates. Please tell me which subordinates use the MIS and how they use it to accomplish their job. The purpose of this question was to capture top level management's awareness of MIS usage within their unit. Responses from individual participants gave very clear answers regarding actual MIS usage by specific members of their unit. All TLM participants demonstrated a solid idea of MIS usage within their areas.

In the organizational units in which the MIS has been applied, have the number of personnel changed as a consequence?

Table 39. Changes at the Clerical Level

RESPONSE/TYPE	WIMS	BHAN	MMOIS	TOTAL
YES/INCREASE	1	8	1	10
YES/DECREASE	0	1	1	2
NO	3	2	5	10
-----				
-----				
TOTAL	4	11	7	22

Of the 22 responses, 10 (45.5%) were increases, 2 cases (9.1%) were decrease, while 10 (45.5%) saw no change.



Table 40. Changes at the First Line Supervisor Level

RESPONSE/TYPE	WIMS	BHAN	MMOIS	TOTAL
YES/INCREASE	0	2	1	3
YES/DECREASE	0	0	0	0
NO	4	9	6	19
-----				
TOTAL	4	11	7	22

Three changes at this level were increases (13.6%) while 19 (86.4%) saw no change.

Table 41. Changes at the Middle/Top Management Level

RESPONSE/TYPE	WIMS	BHAN	MMOIS	TOTAL
YES/INCREASE	0	0	1	1
YES/DECREASE	0	0	0	0
NO	4	11	6	21
-----				
TOTAL	4	11	7	22

Only one participant (4.5%) indicated a change at this level and identified it as an increase.

This question discriminated MIS impact on different levels. The level affected least by the existence of an MIS is middle/top management, in contrast to the predictions of Leavitt and Whisler (75) of a decline in middle management. This may be partially explained by the bureaucratic nature of the military. The large increase among BHAN users at the clerical level was due to summer overhires and not directly caused by the MIS.

Responses to Individual Questions - (Mid Level Management/  
First Line Supervisor) (n=66)

The following questions were asked only of mid level managers and first line supervisors. Side-by-side comparison with top level management is not possible.

Have you perceived any overall changes in the following departmental/interdepartmental aspects of manager-subordinate relationship since implementation of the MIS? How much of the change do you attribute to the MIS? In the following ten questions, participants were asked to think about any changes to different aspects of their relationship with others. If a change was evident, the participant rated how much of the change was attributed to the MIS.

For the first five questions, participants were asked to consider only their own sub-unit or department. The last five questions were phrased basically the same but participants were asked to consider the organization as a whole. The 66 mid level managers/first line supervisors gave the following results:

(DEPARTMENTAL)

The first question under departmental relationships concerned subordinates requesting authorization from the participant. 25 (37.9%) participants indicated a change in this aspect.

Of the 25 who indicated a change:

Table 42. Subordinates Requesting  
Authorization From You - By Organization

	change was not caused by MIS					change was all caused by MIS				
	[	1	2	3	4	5	]			
WIMS (n=6)		1	0	3	0	2				
Mean = 3.3										
BHAN (n=8)		1	1	2	2	2				
Mean = 3.4										
MMOIS (n=11)		3	3	3	1	1				
Mean = 2.5										
-----										
-----										
TOTAL		5	4	8	3	5				
Overall Mean = 3.0										

Overall, users were non-committal regarding MIS impact. WIMS and BHAN users showed slight perceptions of MIS impact, but MMOIS users felt the impact of MMOIS was not a large factor.

The second question under departmental relationships concerned subordinates requesting action from the participant. 27 (40.9%) participants indicated a change in this aspect.

Of the 27 who indicated a change:

Table 43. Subordinates Requesting Action From You - By Organization

change was not caused by MIS						change was all caused by MIS	
	[	1	2	3	4	5	]
WIMS (n=7) Mean = 3.7		0	0	3	3	1	
BHAN (n=9) Mean = 3.8		0	1	2	4	2	
MMOIS (n=11) Mean = 2.5		2	2	6	1	0	
-----							
-----							
TOTAL		2	3	11	8	3	
Overall Mean = 3.3							

Overall, participants who indicated a change felt some MIS impact on that change. WIMS and BHAN users felt changes to this aspect of departmental relationships were nearly all caused by the MIS. MMOIS users disagreed.

The third question under departmental relationships concerned the participants receiving reports on operations. 34 (51.5%) participants indicated a change in this aspect.

Of the 34 who indicated a change:

Table 44. Your Receiving Reports  
on Operations - By Organization

	change was not caused by MIS					change was all caused by MIS				
	[	1	2	3	4	5	]			
WIMS (n=15) Mean = 3.3		1	4	3	3	4				
BHAN (n=9) Mean = 3.2		1	1	3	3	1				
MMOIS (n=10) Mean = 3.4		0	1	5	3	1				
-----										
TOTAL		2	6	11	9	6				
-----										
Overall Mean = 3.3										

For this question, all users identified some MIS impact in connection with change to their receiving reports on operations.

The fourth question under departmental relationships concerned the participants giving information to subordinates. 41 (62.1%) participants indicated a change in this aspect.

Of the 41 who indicated a change:

Table 45. Your Giving Information to Subordinates - By Organization

	change was not caused by MIS					change was all caused by MIS				
	[	1	2	3	4	5	]			
WIMS (n=13) Mean = 3.1		0	6	2	3	2				
BHAN (n=13) Mean = 4.1		0	1	2	5	5				
MMOIS (n=15) Mean = 2.7		0	6	4	3	2				
-----										
TOTAL		0	13	8	11	9				
Overall Mean = 3.4										

Overall, users were slightly committed to MIS impact on changes. BHAN users had strong perceptions that BHAN caused changes to this aspect. WIMS and MMOIS users are divided on their ratings.

The fifth question under departmental relationships concerned the participants requesting something from subordinates. 34 (51.5%) participants indicated a change in this aspect.

Table 46. Your Requesting Something From Subordinates - By Organization

change was not caused by MIS	change was all caused by MIS					
[	1	2	3	4	5	]
WIMS (n=11) Mean = 2.6	0	7	1	3	0	
BHAN (n=10) Mean = 4.0	0	1	2	3	4	
MMOIS (n=13) Mean = 3.3	2	0	6	2	3	
-----						
-----						
TOTAL	2	8	9	8	7	
Overall Mean = 3.3						

Overall, users identified some MIS impact on change. BHAN users rated the impact of BHAN very high. WIMS and MMOIS users are divided on their perceptions.

(INTERDEPARTMENTAL)

The first question under interdepartmental relationships concerned participants requesting authorization from colleagues/superiors. 35 (53.1%) participants indicated a change in this aspect.

Of the 35 who indicated a change:

Table 47. Your Requesting Authorization  
From Colleagues/Superiors - By Organization

change was not caused by MIS						change was all caused by MIS	
	[	1	2	3	4	5	]
WIMS (n=7) Mean = 3.6		2	0	0	2	3	
BHAN (n=15) Mean = 3.4		1	3	3	5	3	
MMOIS (n=13) Mean = 2.8		1	5	3	3	1	
-----							
-----							
TOTAL		4	8	6	10	7	
Mean = 3.2							

Participants who indicated changes remained slightly more than neutral on MIS impact. WIMS and BHAN users both perceived slight impact from their MIS on this aspect, but MMOIS users remained non-committed.



The second question under interdepartmental relationships concerned participants requesting action from colleagues/superiors. 38 (57.6%) participants indicated a change in this aspect.

Of the 38 who indicated a change:

Table 48. Your Requesting Superiors  
or Colleagues for Action - By Organization

change was not caused by MIS	change was all caused by MIS					
[	1	2	3	4	5	]
WIMS (n=9) Mean = 3.6	1	2	0	3	3	
BHAN (n=17) Mean = 3.1	0	6	2	6	3	
MMOIS (n=12) Mean = 2.9	1	4	3	3	1	
-----						
-----						
TOTAL	2	12	5	12	7	
Overall Mean = 3.3						

Overall, user perceived some MIS impact on change. MMOIS and BHAN users remained non-committal, but WIMS users showed stronger perceptions of MIS impact.

The third question under interdepartmental relationships concerned participants receiving reports on operations.

36 (54.5%) participants indicated a change in this aspect.

Of the 36 who indicated a change:

Table 49. Your Receiving Reports  
on Operations - By Organization

change was not caused by MIS	change was all caused by MIS					
[	1	2	3	4	5	]
WIMS (n=12) Mean = 3.5	1	1	3	5	2	
BHAN (n=10) Mean = 3.0	0	4	2	4	0	
MMOIS (n=14) Mean = 3.1	2	1	6	4	1	
-----						
-----						
TOTAL	3	6	11	13	3	
Overall Mean = 3.2						

Overall, user perception of MIS impact was slightly more than neutral. WIMS users tended to feel changes to this aspect of interdepartmental relationships were caused by WIMS. BHAN and MMOIS users are divided on the question.

The fourth question under interdepartmental relationships concerned participants giving information to superiors/colleagues. 56 (84.8%) participants indicated a change in this aspect.

Of the 56 who indicated a change:

Table 50. Your Giving Information to Superiors or Colleagues - By Organization

change was not caused by MIS	change was all caused by MIS				
[ 1 2 3 4 5 ]					
WIMS (n=16) Mean = 3.7	0	5	1	4	6
BHAN (n=21) Mean = 3.6	0	5	6	3	7
MMOIS (n=19) Mean = 3.1	3	3	6	4	3
-----					
-----					
TOTAL	3	13	13	11	16
Overall Mean = 3.4					

Overall, users were slightly committed to MIS impact regarding change. WIMS and BHAN users had strong perceptions that their MIS caused changes to this aspect. MMOIS users are divided on their ratings.

The fifth question under interdepartmental relationships concerned superiors/colleagues requesting something from participants. 52 (78.8%) participants indicated a change in this aspect.

Of the 52 who indicated a change:

Table 51. Superiors and Colleagues  
Requesting Something From You - By Organization

change was not caused by MIS	change was all caused by MIS					
[	1	2	3	4	5	]
WIMS (n=15) Mean = 3.3	0	5	3	4	3	
BHAN (n=19) Mean = 3.6	1	5	2	3	8	
MMOIS (n=18) Mean = 3.2	3	2	5	5	3	
-----						
-----						
TOTAL	4	12	10	12	14	
Overall Mean = 3.4						

Overall, all three MIS users were slightly committed to MIS impact regarding change, with BHAN users rated the impact of BHAN fairly strong.

Summary. A side-by-side comparison of departmental and inter-departmental questions is given in Table 52. For each question, the percent of participants who indicated a change had occurred is given, along with the mean rating of whether the change was caused by the MIS.

Table 52. Summary of Means

DEPARTMENTAL			INTERDEPARTMENTAL		
TABLE	PERCENT CHANGE	MEAN RATING	TABLE	PERCENT CHANGE	MEAN RATING
42	37.9	3.0	47	53.1	3.2
43	40.9	3.3	48	57.5	3.3
44	51.5	3.3	49	54.5	3.2
45	62.1	3.4	50	84.8	3.4
46	51.5	3.3	51	78.8	3.4

This data shows significant differences between the number of participants who indicated changes in certain aspects of departmental/interdepartmental relationships.

On the departmental level, few participants reported changes in "subordinates requesting authorization (table 42) or action (table 43) from them." Some participants did report change in "requesting information from subordinates (table 46)" and "receiving departmental reports on operations (table 44)." A large number of participants perceived changes to "giving information to subordinates (table 45)."

On the interdepartmental level, participants saw some change to "requesting authorization (table 47) or action (table 48) from superiors or colleagues," as well as "receiving reports on interdepartmental operations (table 49)." A large majority of participants saw changes in "giving information to (table 50) or answering requests of superiors or colleagues (table 51)." This supports the earlier point that the most prominent usage of MIS was

transfer of information, either in message format via electronic mail or in regular/ad hoc report format.

Have you perceived any influence by the implementation of the MIS on your contact or consultations with your supervisor? Have you perceived any influence by the implementation of the MIS on your contact or consultations with your subordinates? The purpose of these questions is to determine any effect on the user's direct personal contact with immediate supervisors or subordinates.

Table 53. Perceived Changes in Contact With Supervisors

RESPONSE/TYPE	WIMS	BHAN	MMOIS	TOTAL
YES/INCREASE	3	6	4	13
YES/DECREASE	5	1	1	7
NO	15	14	17	46
-----				
TOTAL	23	21	22	66

Of the 66 participants, 13 (19.7%) indicated there had been an increase in personal contact with their supervisor, 7 (10.6%) felt personal contact had decreased, and 46 (69.70%) said there had been no change.

Table 54. Perceived Changes in  
Contact With Subordinates

RESPONSE/TYPE	WIMS	BHAN	MMOIS	TOTAL
YES/INCREASE	4	5	2	11
YES/DECREASE	2	0	4	6
NO	17	16	16	49
-----				
TOTAL	23	21	22	66

Of the 66 participants, 11 (16.7%) indicated there had been an increase in personal contact with their subordinates, 6 (9.1%) felt personal contact had decreased, and 49 (74.2%) felt there had been no change.

Patterns of change seem fairly consistent among all three MIS regarding negative reports of change. However, the largest decrease in contact with supervisors involved WIMS users and the largest decrease in contact with subordinates came from MMOIS users.

Some of the more significant comments regarding personal time with others included: "No change in quantity but contact has more quality," "Able to cut out less important, mundane stuff because that can be sent through E-mail," and "It depends on the boss. Have gone from 'cold-war' (no personal contact at all) to lots of personal time with boss."

Have you perceived any overall changes in the degree of discretion you practice in your organization, regarding influence on specific tasks? How much of the

change do you attribute to the MIS? The purpose of these eight questions was to identify any perceived changes in the degree of discretion practiced by the manager in the context of their daily work. Participants were asked to think about any changes in their work-style. If a change did occur, they were asked to rate how much of the change was caused by the MIS.

The first question under degrees of discretion concerns the degree to which participant determines how a task is carried out. 34 (51.5%) participants indicated a change in this aspect. Of the 34 who indicated a change:

Table 55. Degree to Which You Determine  
How a Task is Carried Out - By Organization

change was not caused by MIS	change was all caused by MIS					
[	1	2	3	4	5	]
WIMS (n=9) Mean = 3.3	1	1	4	0	3	
BHAN (n=15) Mean = 2.9	3	2	6	1	3	
MMOIS (n=10) Mean = 3.3	2	1	1	4	2	
-----						
-----						
TOTAL	6	5	11	5	8	
Overall Mean = 3.2						

Overall, users rated MIS impact as slightly more than neutral. WIMS and MMOIS users felt changes to this



aspect of degrees of discretion were caused somewhat by MIS. BHAN users are divided over the question.

The second question under degrees of discretion concerns the degree to which participant determines when a task is carried out. 31 (47.0%) participants indicated a change in this aspect.

Of the 31 who indicated a change:

Table 56. Degree to Which You Determine  
When a Task is Carried Out - By Organization

	change was not caused by MIS					change was all caused by MIS				
	[	1	2	3	4	5	]			
WIMS (n=12)		2	2	3	3	2				
Mean = 3.1										
BHAN (n=11)		1	1	3	3	3				
Mean = 3.6										
MMOIS (n=8)		1	0	2	3	2				
Mean = 3.6										
-----										
-----										
TOTAL		4	3	8	9	7				
Overall Mean = 3.4										

Overall, users were slightly committed to MIS impact as a factor of change. BHAN and MMOIS users both had strong perceptions that their MIS caused changes to this aspect. WIMS users are divided on their ratings.

The third question under degrees of discretion concerns the degree to which participant determines whether a task is carried out. 32 (48.5%) participants indicated a change in this aspect.

Of the 32 who indicated a change:

Table 57. Degree to Which You Determine Whether a Task Has Been Carried Out - By Organization

	change was not caused by MIS					change was all caused by MIS				
	[	1	2	3	4	5	]			
WIMS (n=10)		0	2	4	2	2				
Mean = 3.4										
BHAN (n=6)		1	1	2	1	1				
Mean = 3.0										
MMOIS (n=16)		4	2	3	3	4				
Mean = 3.1										
-----										
-----										
TOTAL		5	5	9	6	7				
Overall Mean = 3.2										

Overall, users were slightly more than neutral regarding MIS impact. WIMS users showed a slightly stronger perception of MIS impact; BHAN and MMOIS users are nearly identically divided on their ratings.

The fourth question under degrees of discretion concerns the degree to which orders and advice are received from superiors. 33 (50.0%) participants indicated a change in this aspect.

Of the 33 who indicated a change:

Table 58. Degree to Which Orders and Advice Are Received From Superiors - By Organization

change was not caused by MIS						change was all caused by MIS	
	[	1	2	3	4	5	]
WIMS (n=7) Mean = 2.7		2	0	3	2	0	
BHAN (n=14) Mean = 3.7		1	2	1	6	4	
MMOIS (n=12) Mean = 3.0		1	5	1	3	2	
-----							
-----							
TOTAL		4	7	5	11	6	
Overall Mean = 3.3							

Overall, users perceived some MIS impact on change. BHAN users rated the impact of BHAN very high. WIMS and MMOIS users were basically non-committed in their preference.

The fifth question under degrees of discretion concerns the degree to which requests and demands are received from subordinates. 23 (34.8%) participants indicated a change in this aspect.

Of the 23 who indicated a change:

Table 59. Degree to Which Requests and Demands Are Received From Subordinates - By Organization

change was not caused by MIS						change was all caused by MIS	
	[	1	2	3	4	5	]
WIMS (n=6) Mean = 2.8		1	0	4	1	0	
BHAN (n=7) Mean = 3.4		1	0	2	3	1	
MMOIS (n=10) Mean = 2.9		1	2	5	1	1	
-----							
-----							
TOTAL		3	2	11	5	2	
Overall Mean = 3.0							

Overall, users were non-committal on the impact of MIS regarding this aspect of manager discretion. BHAN users showed the only distinct choice with a slight preference towards MIS impact.

The sixth question under degrees of discretion concerns the degree to which participants are controlled in handling tasks. 21 (31.8%) participants indicated a change in this aspect.

Of the 21 who indicated a change:

Table 60. Degree to Which You Are Controlled in Handling Tasks - By Organization

change was not caused by MIS	change was all caused by MIS				
[ 1 2 3 4 5 ]					
WIMS (n=9) Mean = 3.5	2	0	2	1	4
BHAN (n=6) Mean = 3.0	0	3	1	1	1
MMOIS (n=6) Mean = 2.8	1	1	2	2	0
-----					
-----					
TOTAL	3	4	5	4	5
Overall Mean = 3.2					

Overall, users rated MIS impact as slightly more than neutral. WIMS users rated the impact of their MIS very high; BHAN and MMOIS users are divided on their ratings.

The seventh question under degrees of discretion concerns the degree to which participants are dependent on the work of others. 21 (31.8%) participants indicated a change in this aspect.

Of the 21 who indicated a change:

Table 61. Degree to Which You Are  
Dependent on the Work of Others - By Organization

	change was not caused by MIS					change was all caused by MIS				
	[	1	2	3	4	5	]			
WIMS (n=6) Mean = 3.5		1	0	1	3	1				
BHAN (n=12) Mean = 2.8		3	2	4	0	3				
MMOIS (n=3) Mean = 2.3		1	1	0	1	0				
-----										
-----										
TOTAL		5	3	5	4	4				
Overall Mean = 3.0										

Overall, users were non-committed on MIS impact. There are no clear patterns to indicate strong preferences either way.

The eighth question under degrees of discretion concerns the degree to which there are rules, procedures, and methods to be followed. 27 (40.9%) participants indicated a change in this aspect.

Of the 27 who indicated a change:

Table 62. Degree to Which There are Rules, Procedures, and Methods Which are to be Followed - By Organization

change was not caused by MIS	change was all caused by MIS					
[	1	2	3	4	5	]
WIMS (n=11) Mean = 3.1	1	2	4	3	1	
BHAN (n=7) Mean = 3.2	1	1	1	4	0	
MMOIS (n=9) Mean = 3.2	0	1	5	3	0	
-----						
-----						
TOTAL	2	4	10	10	1	
Overall Mean = 3.1						

Overall, all three groups of users were non-committed as to MIS impact. BHAN and MMOIS users showed slightly higher than WIMS users on their ratings.

Summary. A summarization of results for the previous eight questions on task discretion is given in table 63. For each question, the percent of participants indicating a change had occurred is given, along with the mean rating of whether the change was caused by the MIS.

Table 63. Changes in Task Discretion

TABLE	PERCENT CHANGE	MEAN RATING
55	51.5	3.2
56	47.0	3.4
57	48.5	3.2
58	50.0	3.3
59	34.8	3.0
60	31.8	3.2
61	31.8	3.0
62	40.9	3.1

Among the MLM/FLS participants of this case study research, there exists a fairly even perception regarding changes to the amount of discretion allowed in the accomplishment of their tasks. Certain aspects, including the degree in which participants are controlled (table 60) or dependent on others (table 61), showed few changes. The majority of participants do not feel a change had occurred. Of those who did indicate a change, there is no strong evidence that the change was caused by the respective MIS. There are no significant differences among the three organizations.



### Conclusions to Individual Questions

These sections provided data on responses to questions asked of either top level management or mid level/first line supervisors. Results show that MIS appear to have little effect on the number of personnel within each organization, regardless of level. This is most likely due to the relative stability of manning levels within military organizations given the bureaucratic nature of the environment. In some cases, the addition of a MIS may affect immediate manning (due to the additional staff necessary to support the MIS), further changes are unlikely. There has been minimal change in personal contact with superiors or subordinates as a result of MIS.

In terms of departmental/interdepartmental relationships, MIS appear to have some effect on supervisors. Approximately half of participants indicated a change in six of the ten aspects of these relationships (table 52). There was an increase in two cases: giving information to or answering requests from superiors/colleagues. The only areas that showed minimal impact involved subordinates requesting authorization or action from the manager. It is the observation of this researcher that people seemed to bypass the MIS and resort to the old-fashioned personal touch.

In terms of the degrees of discretion practiced by managers, MIS appear to have minor affect. Of the eight questions asked in this area, only one showed a majority

of participants indicating change (table 55 with 51.5%). Even the use of management tools (i.e. status reports and on-line queries) do not appear to change this managerial duty.

Appendix F: Sample WIMS Menu: Base Civil Engineer

```

*****
*** 1 2 3 4 5 6 7 8 ****
*** 12345678901234567890123456789012345678901234567890 ****
*****

* *
* 1* Wang Office - Version 01.61.01 Monday 07/31/89 9:33 am * 1*
* 2* * * * * * * * * * * * * * * * * * * * * * * * * * * * * 2*
* 3* Hello: Jim Dawson * * * * * * * * * * * * * * * * * 3*
* 4* * * * * * * * * * * * * * * * * * * * * * * * * * * * 4*
* 5* PF Key Action PF Key Action * 5*
* 6* * * * * * * * * * * * * * * * * * * * * * * * * * * * 6*
* 7* 1 Read Mail 17 Vehicles Out of Commission * 7*
* 8* 2 Send Memo 18 Fire Vehicles In Commission * 8*
* 9* 3 Send Phone Msg 19 Review Emergency Fire Log * 9*
*10* 4 All Mail Functions Operations Information: *10*
* 1* 21 Job Order Reports * 1*
* 2* 22 Work Order Reports * 2*
* 3* 23 Update/Review Job Orders * 3*
* 4* 24 Update/Review Work Orders * 4*
* 5* * * * * * * * * * * * * * * * * * * * * * * * * * * * 5*
* 6* Project Information: * 6*
* 7* 26 Project Reports * 7*
* 8* 27 Update/Review Project Data * 8*
* 9* 28 Open WO, JO, Projects * 9*
*20* For a Selected Facility *20*
* 1* * * * * * * * * * * * * * * * * * * * * * * * * * * * 1*
* 2* 16/32 Logoff (*Provides quick access to information) * 2*
* 3* * * * * * * * * * * * * * * * * * * * * * * * * * * * 3*
* 4* Base Civil Engineer's Menu bcemenu * 4*
* * * * * * * * * * * * * * * * * * * * * * * * * * * * *
*****
*** 1 2 3 4 5 6 7 8 ****
*** 12345678901234567890123456789012345678901234567890 ****
*****

```

Appendix G: Sample WIMS Regular Report: Emergency Job Orders

REPORT DATE 89/08/29		COMPLETED EMERGENCY JOB ORDERS RECEIVED - ELECTRICAL SHOPS	
		FROM: 890822 TO 890829	
VERSION 2.01.000.000 88/01/14		MJOBEELC MJOBRPT	

JOB ORDER	FCLTY	DATE OPEN	DATE COMPLETE	SHOP	TYPE SVC	EPS DESCRIPTION
2037	34041	890824	890824	468	1 E	INSTALL/REPAIR THERMOSTAT
2171	10856	890825	890825	468	1 E	CENTRAL UNIT, RECHARGE/REPAIR
2313	20640	890828	890828	468	1 E	CENTRAL UNIT, SERVICE & START UNIT
2429	10829	890828	890828	468	1 E	CENTRAL UNIT, RECHARGE/REPAIR
TOTAL JOB ORDERS FOR THIS SHOP =				4		

1822	21630	890823	890825	469	1 E	COIL & ELEMENTS -- REPAIR
1973	30168	890824	890828	469	1 E	SECURITY ALARM -- REPAIR
2283	10262	890827	890828	469	1 E	WIRING -- REPAIR
TOTAL JOB ORDERS FOR THIS SHOP =				3		

1792	20489	890823	890824	471	1 E	SECURITY ALARM -- REPAIR
1793	34042	890823	890823	471	1 E	ELECTRICITY OUT -- RESTORE
1819	20050	890823	890824	471	1 E	SECURITY ALARM -- REPAIR
1820	20020	890823	890824	471	1 E	SECURITY ALARM -- REPAIR
1821	34071	890823	890824	471	1 E	SECURITY ALARM -- REPAIR
1824	10262	890823	890824	471	1 E	SECURITY ALARM -- REPAIR
1832	10866	890823	890824	471	1 E	WIRING -- REPAIR
1836	31230	890823	890824	471	1 E	REACTIVATE
1856	20194	890823	890828	471	1 E	CHECK SYSTEM
1934	20020	890823	890824	471	1 E	SECURITY ALARM -- REPAIR
1953	20016	890823	890824	471	1 E	SECURITY ALARM -- REPAIR
1955	30256	890823	890824	471	1 E	SECURITY ALARM -- REPAIR
1975	20248	890824	890825	471	1 E	SECURITY ALARM -- REPAIR
1977	20050	890824	890824	471	1 E	SECURITY ALARM -- REPAIR
1978	30174	890824	890828	471	1 E	SECURITY ALARM -- REPAIR
1989	20125	890824	890824	471	1 E	REPAIR OUTLET/SWITCH
1995	30210	890824	890824	471	1 E	WIRING -- REPAIR
2034	31214	890824	890824	471	1 E	WIRING -- REPAIR
2049	30002	890824	890825	471	1 E	BALLAST -- REPAIR/REPLACE
2067	20653	890824	890824	471	1 E	ELEVATORS -- REPAIR
2069	20065	890824	890825	471	1 E	CHECK BOX
2075	20125	890824	890824	471	1 E	REACTIVATE

Appendix H: Sample BHAN Roster: Chemical Equipment Inventory

CHEMICAL WARFARE DEFENSE EQUIPMENT

NSN	ITEM	DESCRIPTION	SIZE	MAX BOI	COST
4230-01-101-3984	M-258A1	Decon Kit	----	5 each	3.60
4240-00-165-5026	M-13A2	Filter Element	----	5 sets	10.68
4240-00-542-4450	M-17	Protective Mask	Small	1 each	depot funded
4240-00-542-4451	M-17	Protective Mask	Medium	1 each	depot funded
4240-00-542-4452	M-17	Protective Mask	Large	1 each	depot funded
4240-01-106-0485	M-17A1	Protective Mask	X-Small	1 each	depot funded
4240-00-926-4199	M-17A1	Protective Mask	Small	1 each	depot funded
4240-00-926-4200	M-17A1	Protective Mask	Large	1 each	depot funded
4240-00-926-4201	M-17A1	Protective Mask	Medium	1 each	depot funded
4240-01-143-2017	M-17A2	Protective Mask	X-Small	1 each	depot funded
4240-01-143-2018	M-17A2	Protective Mask	Small	1 each	depot funded
4240-01-143-2019	M-17A2	Protective Mask	Medium	1 each	depot funded
4240-01-143-2020	M-17A2	Protective Mask	Large	1 each	depot funded
4240-01-175-3443	MCU-2/P	Protective Mask	Small	1 each	depot funded
4240-01-175-3444	MCU-2/P	Protective Mask	Medium	1 each	depot funded
4240-01-175-3445	MCU-2/P	Protective Mask	Large	1 each	depot funded
4240-00-999-0420	M-6A2	Hood	----	10 each	7.96



### Bibliography

1. Adams, Carl R. "How Management Users View Information Systems," Decision Sciences, 6: 337-345 (April 1975).
2. Applegate, Lynda M. and others. "Information Technology and Tomorrow's Manager," Harvard Business Review, 66: 128-136 (November-December 1988).
3. Ashen, Melvin. "The Manager and the Black Box," Harvard Business Review, 38: 85-92 (November-December 1960).
4. Assimakopoulos, Nikitas. "The Influence of New Technology in Organization and Management," Information and Management, 14: 195-202 (April 1988).
5. Attewell, Paul and James Rule. "Computing and Organizations: What We Know and What We Don't Know," Communications of the ACM, 27: 1184-1192 (December 1984).
6. Beers, L. W. (Roy). "Organizational Influence on Future Information Systems Architecture," Systems Research, 2: 263-268 (1985).
7. Benbasat, Izak. "An Analysis of Research Methodologies," The Information Systems Research Challenge, edited by F. Warren McFarlan. Harvard Business School Research Colloquium, Boston: Harvard Business School Press, 1984.
8. Benton, F. Warren. EXECUCOMP -- Maximum Management With the New Computers. New York: John Wiley and Sons, Inc., 1983.
9. Bjorn-Anderson, Niels and others. Managing Computer Impact: An International Study of Management and Organizations. Norwood NJ: Ablex Publishing Corp., 1986.
10. Blau, Peter M. and Richard A. Schoenherr. The Structure of Organizations. New York: Basic Books Inc., 1971.
11. Blau, Peter M. and W. Richard Scott. Formal Organizations: A Comparative Approach. San Francisco: Chandler Publishing Co., 1962.

12. Blau, Peter M. and others. "Technology and Organization in Manufacturing," Administrative Science Quarterly, 21: 20-40 (March 1976).
13. Boger, Dar C. and others. "Improving Federal Information Systems Management: Technological Opportunities and Social Constraints," Proceedings of the Fourth International Conference on Information Systems. 163-174. Houston: Research and Education in Information Systems, The Society for Information Management, 1983.
14. Bostrom, Robert P. and J. Stephen Heinen. "MIS Problems and Failures: A Socio-Technical Perspective. Part I: The Causes," MIS Quarterly, 1: 17-32 (September 1977).
15. -----, "MIS Problems and Failures: A Socio-Technical Perspective. Part II: The Application of Socio-Technical Theory," MIS Quarterly, 1: 11-28 (December 1977).
16. Bozeman, Barry and Stuart Bretschneider. "Public Management Information Systems: Theory and Prescription," Public Administration Review, 46: 475-487 (Special Issue/November 1986).
17. Brannen, Kathleen C. "Management Information Systems: View Them as an Innovation for Successful Implementation," Proceedings and Abstracts of the American Institute for Decision Sciences Annual Meeting, Western Regional Conference. 234-236. Atlanta: American Institute for Decision Sciences, 1982.
18. Burlingame, John F. "Information Technology and Decentralization," Harvard Business Review, 39: 121-126 (November/December 1961).
19. Canning, Richard G. "The Automated Office: Part 2" EDP Analyzer, 16: 1-13 (October 1978).
20. Carroll, Donald C. "Implications of On-Line, Real-Time Systems for Managerial Decision-Making," The Impact of Computers on Management, edited by Charles A. Myers. Cambridge MA: MIT Press, 1967.
21. Carter, Nancy M. "Computerization as a Predominate Technology: Its Influence on the Structure of Newspaper Organizations," Academy of Management Journal, 27: 247-270 (June 1984).



22. Clark, Lt Col Thomas D. and Capt Douglas J. Blazer. "Designing a Flexible Management Information System," Defense Management Journal, 16: 44-48 (First Quarter 1980).
23. Clowes, Kenneth W. The Impact of Computers on Managers. Ann Arbor MI: UMI Research Press, 1982.
24. Cox, Bruce B. "Management Information Systems and Organizational Structure," Library Software Review, 6: 5-10 (January/February 1987).
25. Culnan, Mary J. "The Intellectual Development of Management Information Systems, 1972 - 1982: A Co-Citation Analysis," Management Science, 32: 156-172 (February, 1986).
26. Daft, Richard L. and Robert H. Lengel. Information Richness: A New Approach to Managerial Behavior and Organization Design: Technical Report TR-ONR-DG-02. College Station TX: Texas A & M University, May 1983 (AD-A128980).
27. Daft, Richard L. and Richard M. Steers. Organizations: A Micro/Macro Approach. Glenview IL: Scott, Foresman and Co., 1986.
28. Danziger, James N. "Computers and the Frustrated Chief Executive," MIS Quarterly, 1: 43-53 (June 1977).
29. ----- "Computers, Local Governments, And the Litany to EDP," Public Administration Review, 37: 28-37 (January/February 1977).
30. Danziger, James N. and Kenneth L. Kraemer. People and Computers: The Impacts of Computing on End-Users in Organizations. New York: Columbia University Press, 1986.
31. Davis, Charles K. and James C. Wetherbe. "An Analysis of The Impact of Distributed Data Processing on Organizations in the 1980's," MIS Quarterly, 3: 47-56 (December 1979).
32. Davis, Gordon B. and Margrethe H. Olson. Management Information Systems: Conceptual Foundations, Structure, and Development (Second Edition). New York: McGraw-Hill, Inc., 1985.

33. Dawson, Patrick and Ian McLoughlin. "Computer Technology and the Redefinition of Supervision: A Study of the Effects of Computerization on Railway Freight Supervisors," Journal of Management Studies, 23: 116-132 (January 1986).
34. Delehanty, George E. "Organization Structure in Insurance Firms," The Impact of Computers on Management, edited by Charles A. Myers. Cambridge MA: MIT Press, 1967.
35. Downs, Anthony. "A Realistic Look at the Final Payoffs from Urban Data Systems," Public Administration Review, 27: 204-210 (September/October 1967).
36. Drucker, Peter F. "The Coming of the New Organization," Harvard Business Review, 66: 45-53 (January/February 1988).
37. Dutton, William H. and Kenneth L. Kraemer. "Management Utilization of Computers in American Local Government," Communications of the ACM, 21: 206-218 (March 1978).
38. Eason, Ken. Information Technology and Organizational Change. London: Taylor and Francis, Inc., 1988.
39. Edelman, Franz. "The Management of Information Resources -- A Challenge for American Business," MIS Quarterly, 5: 17-27 (March 1981).
40. Ein-Dor, Phillip and Eli Segev. "Organizational Context and MIS Structure: Some Empirical Evidence," MIS Quarterly, 6: 55-67 (September 1982).
41. -----, "Organizational Context and the Success of Management Information Systems," Management Science, 24: 1064-1077 (June 1978).
42. Emery, James C. "The Impact of Information Technology on Organizations," The Impact of Information Technology on Management Operations, edited by William C. House. Princeton: Auerbach Publishers, Inc., 1971.
43. Emory, C. William. Business Research Methods (Third Edition). Homewood IL: Richard D. Irwin, Inc., 1985.

44. Eno, Eric J. "The Administrative Generalist and MIS," Public Administration Review, 39: 485-488 (September/October 1979).
45. Federico, Pat-Anthony. Management Information Systems and Organizational Behavior (Second Edition). New York: Praeger Publishers, 1985.
46. Foster, Lawrence W. and David M. Flynn. "Management Information Technology: Its Effects on Organizational Form and Function," MIS Quarterly, 8: 229-235 (December 1984).
47. Fry, Louis W. "Technology-Structured Research: Three Critical Issues," Academy of Management Journal, 25: 532-552 (September 1982).
48. Girard, Raymond E. "Productivity and Information Systems," Computers in Healthcare, 10: 26-30 (February 1989).
49. Gorr, Wilpen L. "People and Computers," (Book Review). Public Administration Review, 48: 823 (July/August 1988).
50. Gulick, Luther. "Notes on the Theory of Organization," Classics of Public Administration, edited by Jay M. Shafritz and Albert C. Hyde. Oak Park IL: Moore Publishing Co. Inc., 1978.
51. Hall, Richard H. Organizations: Structure and Process (Third Edition). Englewood Cliffs NJ: Prentice-Hall, Inc., 1982.
52. Harvey, Edward. "Technology and the Structure of Organizations," American Sociological Review, 33: 247-259 (February 1968).
53. Head, Robert V. Federal Information Systems Management: Issues and New Directions. Washington: The Brookings Institution, 1982.
54. Henderson, John C. and David A. Schilling. "Design and Implementation of Decision Support Systems in the Public Sector," MIS Quarterly, 9: 157-168 (June 1985).
55. Hickson, David J. and others. "Operations Technology and Organizational Structure: An Empirical Reappraisal," Administrative Science Quarterly, 14: 378-397 (1969).

56. Horton, Forest W. and Donald A. Marchand. Information Management in Public Administration. Arlington VA: Information Resources Press, 1982.
57. Howe, Richard C. and Veronica Oestreicher. "Corporate Strategies: Organizational Structure," Computers In Healthcare, 9: 24-27 (June 1988).
58. Huse, Edgar F. "The Impact of Computerized Programs on Managers and Organizations: A Case Study in an Integrated Manufacturing Company," The Impact of Computers on Management, edited by Charles A. Myers. Cambridge MA: MIT Press, 1967.
59. Ives, Blake and others. "A Framework For Research in Computer-Based Management Information Systems," Management Science, 26: 910-934 (September 1980).
60. Jefferies, Chris L. "Public Administration and the Military," Public Administration Review, 37: 321-333 (July/August 1977).
61. Jenkins, A. Milton. Research Methodologies and MIS Research: Discussion Paper No. 277. Bloomington IN: Division of Research, School of Business, Indiana University, November 1984.
62. Kanter, Jerome. Management-Oriented Management Information Systems (Second Edition). Englewood Cliffs NJ: Prentice-Hall, Inc., 1977.
63. King, John Leslie. "Centralized Versus Decentralized Computing: Organizational Considerations and Management Options," Computing Surveys, 15: 319-349 (December 1983).
64. ----. "Local Government Use of Information Technology: The Next Decade," Public Administration Review, 42: 25-36 (January/February 1982).
65. King, John Leslie and Kenneth L. Kraemer. "The Dynamics of Change in Computing Use: A Theoretical Framework," Computers Environment and Urban Systems, 11: 5-25 (Fall 1986).
66. Klatzky, S. R. "Automation, Size, and the Locus of Decision Making: The Cascade Effect," The Journal of Business, 43: 141-151 (April 1970).

67. Kling, Rob. "Social Analyses of Computing: Theoretical Perspectives in Recent Emperical Research," ACM Computing Surveys, 12: 61-110 (Mar 1980).
68. Kraemer, Kenneth L. and James N. Danziger. "Computers and Control in the Work Environment," Public Administration Review, 44: 32-42 (January/February 1984).
69. Kraemer, Kenneth L. and John Leslie King. Computers and Local Government. Volume 1: A Managers Guide. New York: Praeger Publishers, Inc., 1977.
70. Kraemer, Kenneth L. and John Leslie King. "Computing and Public Organizations," Public Administration Review, 46: 488-496 (Special Issue/November 1986).
71. Kraemer, Kenneth L. and John Leslie King. Computers, Power, and Urban Management: What Every Local Executive Should Know. Sage Professional Papers in Administrative and Policy Studies, vol. 3, series no. 03-031. Beverly Hills CA: Sage Publications, Inc., 1976.
72. Kraemer, Kenneth L. and James L. Perry. "The Federal Push to Bring Computer Applications to Local Governments," Public Administration Review, 39: 260-270. (May/June 1979).
73. Kraut, Robert, and others. "Computerization, Productivity, and Quality of Work-Life," Communications of the ACM, 32: 220-238 (February 1989).
74. Laudon, Kenneth C. Computers and Bureaucratic Reform: The Political Functions of Urban Information Systems. New York: John Wiley and Sons, 1974.
75. Leavitt, Harold J. and Thomas L. Whistler. "Management in the 1980's," Harvard Business Review, 36: 41-48 (November/December, 1958).
76. Lucas, Henry C. Jr. Computer-Based Information Systems in Organizations. Chicago: Science Research Associates, Inc., 1973.
77. Maish, Alexander M. "A User's Behavior Toward His MIS," MIS Quarterly, 3: 39-52 (March 1979).

78. Markus, M. Lynne and Daniel Robey. "Information Technology and Organizational Change: Causal Structure in Theory and Research," Management Science, 34: 583-598 (May 1988).
79. Miwald, Robert D. "Weberian Bureaucracy and the Military Model," Public Administration Review, 30: 129-133 (March/April 1970).
80. Mumford, Enid and Olive Banks. The Computer and the Clerk. London: Routledge and Kegan Paul, Limited, 1967.
81. O'Brien, John L. Mutual Misperceptions: A Comparison of Public Administration Education and Professional Military Education. MFA thesis. Governors State University, Park Forest South IL, December 1986
82. Olson, Margrethe H. and Norman L. Chervany. "The Relationship Between Organizational Characteristics and the Structure of the Information Services Function," MIS Quarterly, 4: 57-68 (June 1980).
83. Olson, Margrethe H. and Henry C. Lucas Jr. "The Impact of Office Automation on the Organization: Some Implications for Research and Practice," Communications of the ACM, 25: 838-847 (November 1982).
84. Meyer, Marshall W. "Automation and Bureaucratic Structure," American Journal of Sociology, 74: 256-264 (November 1968).
85. Perrow, Charles B. Organizational Analysis: A Sociological View. Belmont CA: Wadsworth Publishing Co., Inc., 1970.
86. Peters, Tom. Thriving on Chaos: Handbook For a Management Revolution. New York: Alfred Knopf, Inc., 1987.
87. Pfeffer, Jeffrey. Organizational Design. Arlington Heights IL: AHM Publishing Corp., 1978.
88. Pfeffer, Jeffrey and Huseyin Leblebici. "Information Technology and Organizational Structure," Pacific Sociological Review, 20: 241-261 (April 1977)
89. Power, Daniel J. "The Impact of Information Management on the Organization: Two Scenarios," MIS Quarterly, 7: 13-20 (September 1983).

90. Pugh, Derek S. and others. "Dimensions of Organizational Structure," Administrative Science Quarterly, 13: 65-105 (1968).
91. Reif, William E. Computer Technology and Management Organizations. Iowa City: Bureau of Business and Economic Research, College of Business Administration, University of Iowa, 1968.
92. Robey, Daniel. "Computers and Management Structure: Some Empirical Findings Re-examined," Human Relations, 30: 963-976 (1977).
93. Robey, Daniel. "Computer Information Systems and Organization Structure," Communications of the ACM, 24: 679-687 (October 1981).
94. Robey, Daniel. "Implementation and the Organizational Impacts of Information Systems," Interfaces, 17: 72-84 (May-June 1987).
95. Robey, Daniel and M. Lynne Markus. "Rituals in Information Systems Design," MIS Quarterly, 8: 5-15 (March 1984).
96. Senn, James A. "Essential Principles of Information Systems Development," MIS Quarterly, 2: 17-26 (June 1978).
97. Simon, Herbert J. "The Proverbs of Administration," Public Administration Review, 6: 53-67 (Winter 1946).
98. Smeds, Riitta. "The Role of Computerized Information Systems in the Development of Organizational Structure," International Studies of Management and Organizations, 17: 90-104 (Winter 1988).
99. Stewart, Rosemary. How Computers Affect Management. Cambridge MA: MIT Press, 1971.
100. Stupak, Ronald J. "Military Professionals and Civilian Careerists in the Department of Defense," Air University Review, 32: 68-75 (July/August 1981).
101. Taylor, James C. Technology and Planned Organizational Change. Ann Arbor MI: Center for Research on Utilization of Scientific Knowledge, The University of Michigan, 1971.

102. Taylor, James R. and Jo Mulamba Katambwe. "Are New Technologies Really Reshaping Our Organizations?" Computer Communications, 11: 245-252 (October 1988).
103. Thayer, Frederick C. Organizing the Politics and Economics of Survival. New York: Franklin Watts, Inc., 1973.
104. Thompson, James D. Organization in Action. New York: McGraw-Hill Inc., 1967.
105. Tsaklanganos, Angelos A. "Peers, Persuasion, and Horizontal Management," Management Accounting, 60: 33-37 (August 1978).
106. Van Fleet, David D. "Span of Management Research and Issues," Academy of Management Review, 26: 546-552 (September 1983).
107. Van Fleet, David D. and Arthur G. Bedeian. "A History of the Span of Management," Academy of Management Review, 2: 356-372 (July 1977).
108. Vergin, Roger C. "Computer-induced Organizational Changes," The Impact of Information Technology on Management Operations, edited by William C. House. Princeton NJ: Auerbach Publishing Inc., 1971.
109. Vincent, Maj. C. E. "MIS -- Lessons Learned," The Air Force Comptroller, 13: 22-23 (July 1979).
110. Wagner, L. G. "Computers, Decentralization, and Corporate Control," California Management Review, 9: 25-32 (Winter 1966).
111. Whisler, Thomas L. The Impact of Computers on Organizations. New York: Praeger Publishers Inc., 1970.
112. Whisler, Thomas L. "Impact on Organizational Control" The Impact of Computers on Management, edited by Charles A. Myers. Cambridge MA: MIT Press, 1967.
113. Whisler, Thomas L. Information Technology and Organization Change. Belmont CA: Wadsworth Publishing Co. Inc., 1970.
114. Williams, Anne and Christopher Rowe. "Office Automation and Organisational Change -- The Need for a New Kind of Manager?" Industrial Management and Data Systems, unknown volume: 3- 7 (May/June 1988).



115. Withington, Frederic G. The Real Computer: Its Influences, Uses, and Effects. Reading MA: Addison-Wesley Publishing Co. Inc., 1969.
116. Woodward, Joan. Industrial Organization: Behavior and Control. London: Oxford University Press, 1970.
117. Zmud, Robert W. and James F. Cox. "The Implementation Process: A Change Approach," MIS Quarterly, 3: 35-43 (June 1979).
118. Zwerman, William L. New Perspectives on Organizational Theory. Westport CN: Greenwood Publishing Corp., 1970.

### Vita

Captain John L. O'Brien enlisted in the United States Air Force on 16 August 1979 and served for six years as a guitarist with the 505th Air Force Band, Chanute AFB IL. He received his commission on 30 July 1985 and served as administration officer and executive officer for the 71st Student Squadron, Vance AFB OK until his selection for the Air Force Institute of Technology's Information Resource Management program. Captain O'Brien holds a Masters Degree in Public Administration.

Permanent Address: 6024 West Waveland Avenue  
Chicago IL 60634

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE

## REPORT DOCUMENTATION PAGE

Form Approved  
OMB No. 0704-0188

1a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED			1b. RESTRICTIVE MARKINGS		
2a. SECURITY CLASSIFICATION AUTHORITY			3 DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release; distribution unlimited		
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE					
4. PERFORMING ORGANIZATION REPORT NUMBER(S) AFIT/GIR/LSY/89D-7			5. MONITORING ORGANIZATION REPORT NUMBER(S)		
6a. NAME OF PERFORMING ORGANIZATION; School of Systems and Logistics		6b. OFFICE SYMBOL (if applicable) AFIT/LSY	7a. NAME OF MONITORING ORGANIZATION		
6c. ADDRESS (City, State, and ZIP Code) Air Force Institute of Technology Wright-Patterson AFB OH 45433-6583			7b. ADDRESS (City, State, and ZIP Code)		
8a. NAME OF FUNDING/SPONSORING ORGANIZATION		8b. OFFICE SYMBOL (if applicable)	9 PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER		
8c. ADDRESS (City, State, and ZIP Code)			10. SOURCE OF FUNDING NUMBERS		
			PROGRAM ELEMENT NO	PROJECT NO.	TASK NO.
			WORK UNIT ACCESSION NO.		
11. TITLE (Include Security Classification) THE EFFECT OF MANAGEMENT INFORMATION SYSTEMS ON SUPERVISORS WITHIN A MILITARY ENVIRONMENT					
12. PERSONAL AUTHOR(S) John L. O'Brien, B.A., M.P.A., Capt, USAF					
13a. TYPE OF REPORT MS Thesis		13b. TIME COVERED FROM _____ TO _____		14. DATE OF REPORT (Year, Month, Day) 1989, December	
				15. PAGE COUNT 187	
16. SUPPLEMENTARY NOTATION					
17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)		
FIELD	GROUP	SUB-GROUP			
05	01		Management Information Systems      Supervision		
			Military Organizations      Span of Control		
19. ABSTRACT (Continue on reverse if necessary and identify by block number)					
<p>Thesis Advisor: D. J. McBride, Lt Col, USAF Assistant Professor Department of Systems Acquisition Management</p> <p>Approved for public release: IAW AFR 190-1. <i>Larry W. Emmelhainz</i> LARRY W. EMMELHAINZ, Lt Col, USAF 12 Jan 90 Director of Research and Consulting Air Force Institute of Technology (AU) Wright-Patterson AFB OH 45433-6583</p>					
20. DISTRIBUTION/AVAILABILITY OF ABSTRACT <input checked="" type="checkbox"/> UNCLASSIFIED/UNLIMITED <input type="checkbox"/> SAME AS RPT. <input type="checkbox"/> DTIC USERS			21. ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED		
22a. NAME OF RESPONSIBLE INDIVIDUAL D. J. McBride, Assistant Professor			22b. TELEPHONE (Include Area Code) (513) 255-4845		22c. OFFICE SYMBOL AFIT/LSY

UNCLASSIFIED

Studies on the effect of management information systems (MIS) on organizational structure have been disparate. Research has documented changing spans of supervisory control and modifications to the number of levels of hierarchy in public and private sector organizations. Unfortunately, existing MIS research does not often apply to public sector/military MIS. This thesis examined military organizations and studied user perceptions regarding the relationship between MIS implementation and organizational structure changes.

Organizational structure changes will be determined by focusing on two specific characteristics: supervisory span of control and vertical complexity. Perceived changes to these characteristics (increases/decreases) were measured from two levels: top level management and mid-level/first line supervisors.

The study found that, for the specific research population, a perceived change in span of control did not occur following MIS implementation. There is some evidence of both increases and decreases to span of control but the data is not strong enough to suggest any direct causal relationship.

The study also found that, for the specific research population, little perceived changes in the vertical complexity of the organizational hierarchy occurred following implementation of MIS. What changes did occur were basically decreases, but the data is not strong enough to suggest any direct causal relationship.

Within a military environment, MIS appear to have little formal effect on span of control or vertical complexity. However, MIS do appear to have stronger informal effect. Military managers found an increased tendency to overlook formal reporting relationships and formal chain of command. MIS provided more opportunities for informal communication with subordinates, regardless of whom they worked for or what department they worked in.

UNCLASSIFIED